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(12) **United States Design Patent** (10) **Patent No.:** **US D986,928 S**
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(54) **FLUID END FOR A PUMPING SYSTEM**

FOREIGN PATENT DOCUMENTS

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CN 201149099 11/2008
CN 102748483 10/2012

(Continued)

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OTHER PUBLICATIONS

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Covert Manufacturing, Inc., "Fluid End Block: Covert Manufacturing", (site visited Jul. 30, 2021), covertmfg.com, URL:<http://www.covertmfg.com/our-capabilities/fluid-end-block/> (Year: 2021).*

(Continued)

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(57) **CLAIM**

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The ornamental design for a fluid end for a pumping system, substantially as shown and described.

(51) **LOC (14) Cl.** **15-04**

DESCRIPTION

(52) **U.S. Cl.**

USPC **D15/21**; D15/7

(58) **Field of Classification Search**

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D23/259, 269, 235; D10/121; D12/218

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53/02; E21B 44/06

See application file for complete search history.

FIG. 1 is a perspective view of a fluid end;
FIG. 2 is a front view of the fluid end;
FIG. 3 is a back view of the fluid end;
FIG. 4 is a right side view of the fluid end;
FIG. 5 is a left side view of the fluid end;
FIG. 6 is a top view of the fluid end;
FIG. 7 is a bottom view of the fluid end;
FIG. 8 is an enlarged view taken along line 8-8 from FIG. 2;
FIG. 9 is an enlarged view taken along line 9-9 from FIG. 6; and,
FIG. 10 is an enlarged view taken along line 10-10 from FIG. 7.

The long dash dot broken lines in FIGS. 2, 6 and 7 are provided to define the field of enlargement on FIGS. 7-10, the short dash dot broken lines on FIGS. 7-10 define the bounds of those enlarged regions and form no part of the claimed design.

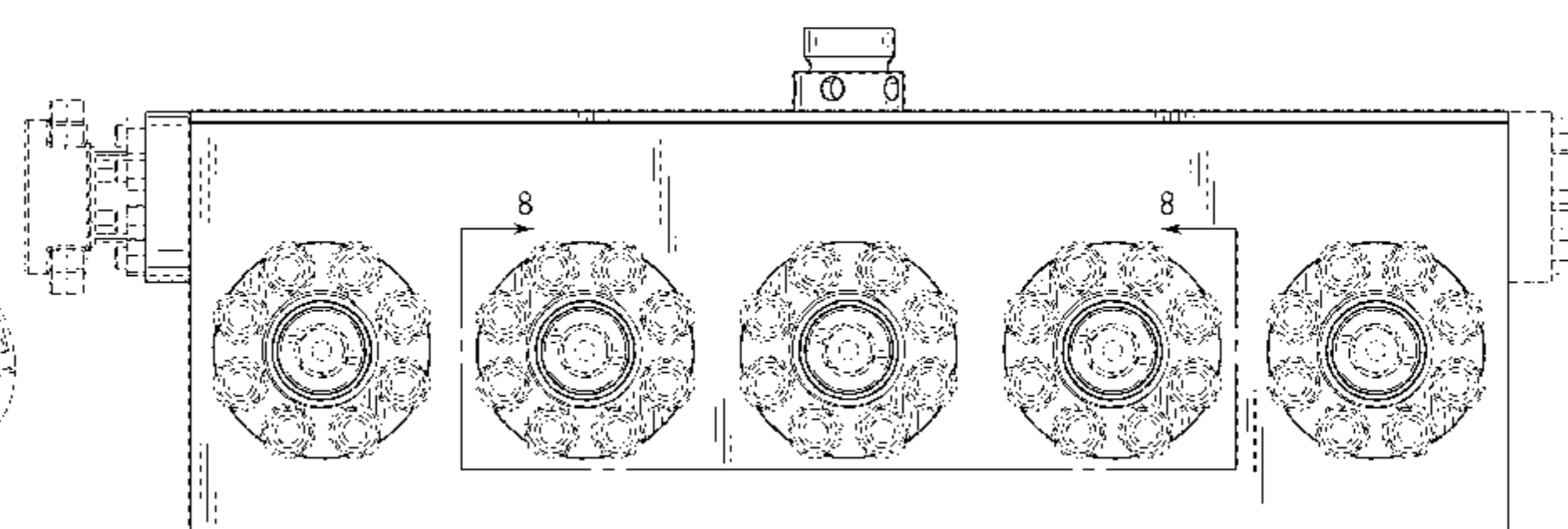
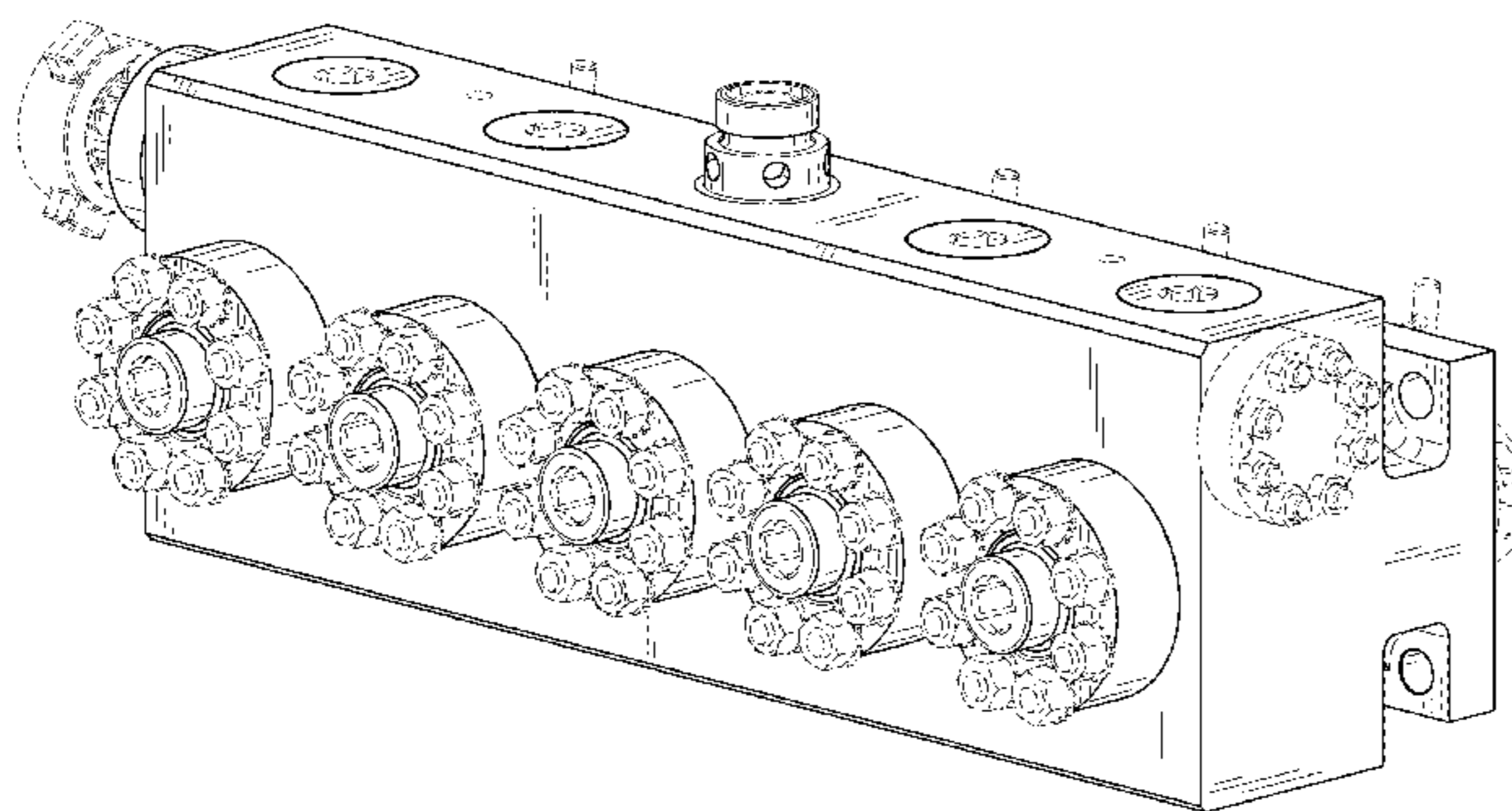
(56) **References Cited**

U.S. PATENT DOCUMENTS

1,576,269 A 3/1926 Durant
1,595,459 A 8/1926 Durant

(Continued)

1 Claim, 9 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

1,671,139 A	5/1928	Wilson	5,636,688 A	6/1997	Bassinger
1,873,318 A	8/1932	Eason	5,674,449 A	10/1997	Liang
1,914,737 A	6/1933	Elms	5,834,664 A	11/1998	Aonuma
1,948,628 A	2/1934	Penick	5,859,376 A	1/1999	Ishibashi
1,963,684 A	6/1934	Shimer	5,895,517 A	4/1999	Kawamura
1,963,685 A	6/1934	Shimer	5,949,003 A	9/1999	Aoki
2,011,547 A	8/1935	Campbell	6,139,599 A	10/2000	Takahashi
2,069,443 A	2/1937	Hill	6,200,688 B1	3/2001	Liang
2,103,504 A	12/1937	White	6,328,312 B1	12/2001	Schmitz
2,143,399 A	1/1939	Abercrombie	6,340,377 B1	1/2002	Kawata
2,304,991 A	12/1942	Foster	6,382,940 B1	5/2002	Blume
2,506,128 A	5/1950	Ashton	6,436,338 B1	8/2002	Qiao
2,547,831 A	4/1951	Mueller	6,460,620 B1	10/2002	LaFleur
2,713,522 A	7/1955	Lorenz	6,464,749 B1	10/2002	Kawase
2,719,737 A	10/1955	Fletcher	6,482,275 B1	11/2002	Qiao
2,745,631 A	5/1956	Shellman	6,485,678 B1	11/2002	Liang
2,756,960 A	7/1956	Church	6,544,012 B1	4/2003	Blume
2,898,082 A	8/1959	Almen	6,623,259 B1	9/2003	Blume
2,969,951 A	1/1961	Walton	6,641,112 B2	11/2003	Antoff
2,982,515 A	5/1961	Clinton	6,695,007 B2	2/2004	Vicars
2,983,281 A	5/1961	Bynum	6,702,905 B1	3/2004	Qiao
3,049,082 A	8/1962	Barry	6,880,802 B2	4/2005	Hara
3,053,500 A	9/1962	Atkinson	6,910,871 B1	6/2005	Blume
3,063,467 A	11/1962	Roberts, Jr.	6,916,444 B1	7/2005	Liang
3,224,817 A	12/1965	Carter	6,951,165 B2	10/2005	Kuhn
3,276,390 A	10/1966	Bloudoff	6,951,579 B2	10/2005	Koyama
3,288,475 A	11/1966	Benoit	6,955,181 B1	10/2005	Blume
3,459,363 A	8/1969	Miller	6,959,916 B2	11/2005	Chigasaki
3,474,808 A	10/1969	Elliott	7,000,632 B2	2/2006	McIntire
3,483,885 A	12/1969	Leathers	7,036,824 B2	5/2006	Kunz
3,489,098 A	1/1970	Roth	7,144,440 B2	12/2006	Ando
3,489,170 A	1/1970	Leman	7,168,440 B1	1/2007	Blume
3,512,787 A	5/1970	Kennedy	7,186,097 B1	3/2007	Blume
3,809,508 A	5/1974	Uchiyama	7,222,837 B1	5/2007	Blume
3,907,307 A	9/1975	Maurer	7,290,560 B2	11/2007	Orr
3,931,755 A	1/1976	Hatridge	7,296,591 B2	11/2007	Moe
4,044,834 A	8/1977	Perkins	7,335,002 B2	2/2008	Vicars
4,076,212 A	2/1978	Leman	7,341,435 B2	3/2008	Vicars
4,184,814 A	1/1980	Parker	7,506,574 B2	3/2009	Jensen
4,219,204 A	8/1980	Pippert	7,513,483 B1	4/2009	Blume
4,277,229 A	7/1981	Pacht	7,513,759 B1	4/2009	Blume
4,331,741 A	5/1982	Wilson	7,611,590 B2	11/2009	Liang
4,395,050 A	7/1983	Wirz	7,681,589 B2	3/2010	Schwegman
4,398,731 A	8/1983	Gorman	7,682,471 B2	3/2010	Levin
4,440,404 A	4/1984	Roach	7,726,026 B1	6/2010	Blume
4,508,133 A	4/1985	Hamid	7,754,142 B2	7/2010	Liang
4,518,359 A	5/1985	Yao-Psong	7,754,143 B2	7/2010	Qiao
4,527,806 A	7/1985	Ungchusri	7,757,396 B2	7/2010	Sawada
4,662,392 A	5/1987	Vadasz	7,789,133 B2	9/2010	McGuire
4,754,950 A	7/1988	Tada	7,793,913 B2	9/2010	Hara
4,763,876 A	8/1988	Oda	7,828,053 B2	11/2010	McGuire
4,770,206 A	9/1988	Sjoberg	7,845,413 B2	12/2010	Shampine
4,807,890 A	2/1989	Gorman	7,861,738 B2	1/2011	Erbes
4,811,758 A	3/1989	Piper	7,866,346 B1	1/2011	Walters
4,861,241 A	8/1989	Gamboa	7,891,374 B2	2/2011	Vicars
4,919,719 A	4/1990	Abe	7,954,510 B2	6/2011	Schwegman
4,951,707 A	8/1990	Johnson	7,992,635 B2	8/2011	Cherewyk
5,020,490 A	6/1991	Seko	8,069,923 B2	12/2011	Blanco
5,052,435 A	10/1991	Crudup	8,075,661 B2	12/2011	Chen
5,061,159 A	10/1991	Pryor	8,083,506 B2	12/2011	Maki
5,062,450 A	11/1991	Bailey	8,100,407 B2	1/2012	Stanton
5,080,713 A	1/1992	Ishibashi	8,141,849 B1	3/2012	Blume
5,088,521 A	2/1992	Johnson	8,181,970 B2	5/2012	Smith
5,127,807 A	7/1992	Eslinger	8,261,771 B2	9/2012	Witkowski
5,131,666 A	7/1992	Hutchens	8,287,256 B2	10/2012	Shafer
5,149,107 A	9/1992	Maringer	8,291,927 B2	10/2012	Johnson
5,209,495 A	5/1993	Palmour	8,317,498 B2	11/2012	Gambier
5,249,600 A	10/1993	Blume	8,375,980 B2	2/2013	Higashiyama
5,267,736 A	12/1993	Pietsch	8,376,723 B2	2/2013	Kugelev
5,273,570 A	12/1993	Sato	8,402,880 B2	3/2013	Patel
5,314,659 A	5/1994	Hidaka	8,430,075 B2	4/2013	Qiao
5,478,048 A	12/1995	Salesky	D687,125 S *	7/2013	Hawes D23/233
5,533,245 A	7/1996	Stanton	8,479,700 B2	7/2013	Qiao
5,540,570 A	7/1996	Schuller	8,528,585 B2	9/2013	McGuire
5,626,345 A	5/1997	Wallace	8,534,691 B2	9/2013	Schaffer
			8,613,886 B2	12/2013	Qiao
			8,662,864 B2	3/2014	Bayyouk
			8,662,865 B2	3/2014	Bayyouk
			8,668,470 B2	3/2014	Bayyouk

(56)

References Cited

U.S. PATENT DOCUMENTS

8,707,853	B1	4/2014	Dille	10,273,954	B2	4/2019	Brown
8,733,313	B2	5/2014	Sato	10,288,178	B2	5/2019	Nowell
8,828,312	B2	9/2014	Yao	10,316,832	B2	6/2019	Byrne
8,870,554	B2	10/2014	Kent	10,330,097	B2	6/2019	Skurdalsvold
8,893,806	B2	11/2014	Williamson	10,344,757	B1	7/2019	Stark
8,940,110	B2	1/2015	Qiao	10,364,487	B2	7/2019	Park
8,978,695	B2	3/2015	Witkowski	D856,498	S	8/2019	Bayyouk
8,998,593	B2	4/2015	Vicars	10,378,535	B2	8/2019	Mahmood
9,010,412	B2	4/2015	McGuire	10,393,113	B2	8/2019	Wagner
9,103,448	B2	8/2015	Witkowski	10,400,764	B2	9/2019	Wagner
9,150,945	B2	10/2015	Bei	10,415,348	B2	9/2019	Zhang
9,157,136	B2	10/2015	Chou	10,428,406	B2	10/2019	Yao
9,157,468	B2	10/2015	Dille	10,428,949	B2	10/2019	Miller
9,206,910	B2	12/2015	Kahn	10,443,456	B2	10/2019	Hoeg
D748,228	S	1/2016	Bayyouk	10,465,680	B1 *	11/2019	Guerra F04B 53/162
9,260,933	B2	2/2016	Artherholt	10,472,702	B2	11/2019	Yeh
9,261,195	B2	2/2016	Toynbee	10,487,528	B2	11/2019	Pozybill
9,273,543	B2	3/2016	Baca	10,519,070	B2	12/2019	Sanders
9,284,631	B2	3/2016	Radon	10,519,950	B2	12/2019	Foster
9,285,040	B2	3/2016	Forrest	10,526,862	B2	1/2020	Witkowski
9,291,274	B1	3/2016	Blume	10,557,446	B2	2/2020	Stecklein
9,322,243	B2	4/2016	Baca	10,557,576	B2	2/2020	Witkowski
9,334,547	B2	5/2016	Qiao	10,557,580	B2	2/2020	Mendyk
9,340,856	B2	5/2016	Otobe	10,563,494	B2	2/2020	Graham
9,359,921	B2	6/2016	Hashimoto	10,563,649	B2	2/2020	Zhang
9,365,913	B2	6/2016	Imaizumi	10,570,491	B2	2/2020	Hong
9,371,919	B2	6/2016	Forrest	10,576,538	B2	3/2020	Kato
9,376,930	B2	6/2016	Kim	10,577,580	B2	3/2020	Abbas
9,377,019	B1	6/2016	Blume	10,577,850	B2	3/2020	Ozkan
9,382,940	B2	7/2016	Lee	10,591,070	B2	3/2020	Nowell
9,435,454	B2	9/2016	Blume	10,605,374	B2	3/2020	Takaki
9,441,776	B2	9/2016	Bryne	10,626,856	B2	4/2020	Coldren
9,458,743	B2	10/2016	Qiao	10,633,925	B2	4/2020	Panda
9,464,730	B2	10/2016	Bihlet	10,634,260	B2	4/2020	Said
9,506,382	B2	11/2016	Yeager	10,640,854	B2	5/2020	Hu
9,528,508	B2	12/2016	Thomeer	10,655,623	B2	5/2020	Blume
9,528,631	B2	12/2016	McCarty	10,663,071	B2	5/2020	Bayyouk
9,534,473	B2	1/2017	Morris	10,670,013	B2	6/2020	Foster
9,534,691	B2	1/2017	Miller	10,670,153	B2	6/2020	Filipow
9,556,761	B2	1/2017	Koyama	10,670,176	B2	6/2020	Byrne
9,568,138	B2	2/2017	Arizpe	10,677,109	B2	6/2020	Qiao
9,605,767	B2	3/2017	Chhabra	10,677,240	B2	6/2020	Graham
9,631,739	B2	4/2017	Belshan	10,677,365	B2	6/2020	Said
D787,029	S	5/2017	Bayyouk	10,711,754	B2	7/2020	Nelson
9,638,075	B2	5/2017	Qiao	10,711,778	B2	7/2020	Buckley
9,638,337	B2	5/2017	Witkowski	10,718,441	B2	7/2020	Myers
9,650,882	B2	5/2017	Zhang	10,731,523	B2	8/2020	Qu
9,651,067	B2	5/2017	Beschorner	10,731,643	B2	8/2020	DeLeon
9,689,364	B2	6/2017	Mack	10,738,928	B2	8/2020	Arizpe
9,695,812	B2	7/2017	Dille	10,753,490	B2	8/2020	Fuller
9,732,746	B2	8/2017	Chandrasekaran	10,753,495	B2	8/2020	Bayyouk
9,732,880	B2	8/2017	Haines	10,767,520	B1	9/2020	Hattiangadi
9,745,968	B2	8/2017	Kotapish	10,774,828	B1	9/2020	Smith
9,784,262	B2	10/2017	Bayyouk	10,781,803	B2	9/2020	Kumar
9,822,894	B2	11/2017	Bayyouk	10,787,725	B2	9/2020	Fujieda
9,845,801	B1	12/2017	Shek	10,801,627	B2	10/2020	Warbey
9,857,807	B2	1/2018	Baca	10,808,488	B2	10/2020	Witkowski
9,915,250	B2	3/2018	Brasche	10,815,988	B2	10/2020	Buckley
9,920,615	B2	3/2018	Zhang	10,830,360	B2	11/2020	Frank
9,927,036	B2	3/2018	Dille	10,851,775	B2	12/2020	Stark
9,945,362	B2	4/2018	Skurdalsvold	10,865,325	B2	12/2020	Nakao
9,945,375	B2	4/2018	Zhang	10,907,738	B2	2/2021	Nowell
9,989,044	B2	6/2018	Bayyouk	10,914,171	B2	2/2021	Foster
10,029,540	B2	7/2018	Seeger	10,934,899	B2	3/2021	Hattiangadi
10,082,137	B2	9/2018	Graham	10,941,866	B2	3/2021	Nowell
10,094,478	B2	10/2018	Iijima	10,954,938	B2	3/2021	Stark
10,113,679	B2	10/2018	Shuck	10,961,607	B2	3/2021	Oshima
10,190,197	B2	1/2019	Baker	10,962,001	B2	3/2021	Nowell
10,197,172	B2	2/2019	Fuller	D916,240	S *	4/2021	Nowell D23/233
10,215,172	B2	2/2019	Wood	10,968,717	B2	4/2021	Tran
10,221,848	B2	3/2019	Bayyouk	10,988,834	B2	4/2021	Lee
10,240,594	B2	3/2019	Barnhouse, Jr.	10,989,321	B2	4/2021	Hattiangadi
10,240,597	B2	3/2019	Bayyouk	11,028,662	B2	6/2021	Rhodes
10,247,182	B2	4/2019	Zhang	11,041,570	B1	6/2021	Buckley
10,247,184	B2	4/2019	Chunn	11,078,903	B2	8/2021	Nowell
				11,104,981	B2	8/2021	Chen
				11,105,185	B2	8/2021	Spencer
				11,105,327	B2	8/2021	Hurst
				11,105,328	B2	8/2021	Bryne

(56)

References Cited

U.S. PATENT DOCUMENTS

11,105,428	B2	8/2021	Warbey		2017/0089473	A1	3/2017	Nowell	
11,111,915	B2	9/2021	Bayyouk		2017/0097107	A1	4/2017	Hotz	
11,131,397	B2	9/2021	Yan		2017/0159655	A1	6/2017	Morreale	
D933,104	S	10/2021	Ellisor		2017/0218951	A1	8/2017	Graham	
D933,105	S	10/2021	Ellisor		2017/0218993	A1*	8/2017	Freed	F04B 19/22
D933,106	S	10/2021	Mullins		2017/0297149	A1	10/2017	Shinohara	
D933,107	S	10/2021	Mullins		2017/0298932	A1	10/2017	Wagner	
11,149,514	B2	10/2021	Witkowski		2017/0314097	A1	11/2017	Hong	
11,162,859	B2	11/2021	Lei		2017/0342776	A1	11/2017	Bullock	
11,181,101	B2	11/2021	Byrne		2017/0342976	A1	11/2017	Reddy	
11,181,108	B2	11/2021	Brooks		2018/0017173	A1	1/2018	Nowell	
11,231,111	B2	1/2022	Hurst		2018/0058431	A1	3/2018	Blume	
11,242,849	B1	2/2022	Smith		2018/0202434	A1*	7/2018	Barnhouse, Jr.	F04B 19/22
2002/0084004	A1	7/2002	Takahashi		2018/0298894	A1	10/2018	Wagner	
2002/0124961	A1	9/2002	Porter		2018/0312946	A1	11/2018	Gigliotti, Jr	
2002/0159914	A1	10/2002	Yeh		2018/0320258	A1	11/2018	Stewart	
2003/0205864	A1	11/2003	Dietle		2018/0340245	A1	11/2018	Kemion	
2003/0233910	A1	12/2003	Jeong		2018/0354081	A1*	12/2018	Kalyani	F04B 39/123
2004/0170507	A1	9/2004	Vicars		2019/0011051	A1*	1/2019	Yeung	F04B 53/10
2004/0194576	A1	10/2004	Ando		2019/0017503	A1	1/2019	Foster	
2004/0234404	A1	11/2004	Vicars		2019/0024198	A1	1/2019	Hong	
2004/0255410	A1	12/2004	Schonewille		2019/0024225	A1	1/2019	Tang	
2004/0258557	A1	12/2004	Shun		2019/0032685	A1*	1/2019	Foster	F04B 1/053
2005/0095156	A1	5/2005	Wolters		2019/0032720	A1	1/2019	Bayyouk	
2005/0200081	A1	9/2005	Stanton		2019/0047049	A1	2/2019	Fujieda	
2005/0226754	A1	10/2005	Or		2019/0049052	A1	2/2019	Shuck	
2006/0002806	A1*	1/2006	Baxter	F04B 39/10 417/539	2019/0063427	A1	2/2019	Nowell	
2006/0027779	A1	2/2006	McGuire		2019/0071755	A1	3/2019	Lee	
2006/0045782	A1	3/2006	Kretzinger		2019/0072088	A1	3/2019	DeLeon	
2007/0086910	A1	4/2007	Liang		2019/0072089	A1*	3/2019	Buckley	F04B 1/0461
2007/0154342	A1	7/2007	Tu		2019/0085806	A1	3/2019	Meibgeier	
2007/0273105	A1	11/2007	Stanton		2019/0085978	A1	3/2019	Chase	
2007/0295411	A1	12/2007	Schwegman		2019/0101109	A1	4/2019	Cortes	
2008/0031769	A1	2/2008	Yeh		2019/0107226	A1	4/2019	Bayyouk	
2008/0092384	A1	4/2008	Schaake		2019/0120389	A1	4/2019	Foster	
2008/0279706	A1	11/2008	Gambier		2019/0136842	A1*	5/2019	Nowell	F04B 53/16
2009/0041611	A1	2/2009	Sathian		2019/0145400	A1*	5/2019	Graham	F04B 1/0538 417/53
2009/0278069	A1	11/2009	Blanco		2019/0145568	A1	5/2019	Nick	
2009/0261575	A1	12/2009	Bull		2019/0154033	A1*	5/2019	Brooks	F04B 53/1087
2010/0272597	A1	12/2010	Qiao		2019/0170137	A1	6/2019	Chase	
2011/0079302	A1	4/2011	Hawes		2019/0170138	A1	6/2019	Bayyouk	
2011/0142701	A1*	6/2011	Small	F04B 53/16 417/521	2019/0194786	A1	6/2019	Chuang	
2011/0189040	A1	8/2011	Vicars		2019/0226058	A1	7/2019	Fujieda	
2011/0255993	A1	10/2011	Ochoa		2019/0063430	A1	8/2019	Byrne	
2012/0141308	A1	6/2012	Saini		2019/0242373	A1*	8/2019	Wernig	F04B 53/16
2012/0163969	A1	6/2012	Ongole		2019/0264683	A1	8/2019	Smith	
2012/0304821	A1	12/2012	Ando		2019/0292633	A1	9/2019	Porret	
2013/0020521	A1	1/2013	Byrne		2019/0301314	A1	10/2019	Kamo	
2013/0202457	A1	8/2013	Bayyouk		2019/0301447	A1	10/2019	Skurdalsvold	
2013/0202458	A1	8/2013	Byrne		2019/0316685	A1	10/2019	Wang	
2013/0319220	A1	12/2013	Luharuka		2019/0376508	A1	12/2019	Wagner	
2014/0083541	A1	3/2014	Chandrasekaran		2020/0056272	A1	2/2020	Hong	
2014/0083547	A1	3/2014	Hwang		2020/0063899	A1	2/2020	Witkowski	
2014/0196883	A1	7/2014	Artherholt		2020/0080660	A1	3/2020	Dyer	
2014/0260954	A1*	9/2014	Young	E21B 43/26 92/169.4	2020/0080661	A1	3/2020	Mullins	
2014/0286805	A1	9/2014	Dyer		2020/0157663	A1	5/2020	Yang	
2014/0322034	A1	10/2014	Bayyouk		2020/0158123	A1	5/2020	Chen	
2014/0348677	A1	11/2014	Moeller		2020/0173317	A1	6/2020	Keating	
2015/0132157	A1	5/2015	Whaley		2020/0208776	A1	7/2020	Bayyouk	
2015/0144826	A1	5/2015	Bayyouk		2020/0217424	A1	7/2020	Rasmussen	
2015/0147194	A1*	5/2015	Foote	F04B 53/16 417/53	2020/0240531	A1	7/2020	Nowell	
2015/0219096	A1	8/2015	Jain		2020/0256149	A1	8/2020	Witkowski	
2015/0300332	A1	10/2015	Kotapish		2020/0284253	A1	9/2020	Foster	
2015/0368775	A1	12/2015	Baker		2020/0284365	A1	9/2020	Bayyouk	
2016/0201169	A1	7/2016	Vecchio		2020/0290118	A1	9/2020	Chen	
2016/0215588	A1	7/2016	Belshan		2020/0291731	A1	9/2020	Haiderer	
2016/0238156	A1	8/2016	Hubenschmidt		2020/0300240	A1	9/2020	Nowell	
2016/0245280	A1	8/2016	Todorov		2020/0308683	A1	10/2020	Xue	
2016/0319626	A1	11/2016	Dille		2020/0347843	A1	11/2020	Mullins	
2016/0319805	A1	11/2016	Dille		2020/0355182	A1	11/2020	DeLeon	
2017/0067459	A1	3/2017	Bayyouk		2020/0392613	A1	12/2020	Won	
					2020/0393054	A1	12/2020	Fuller	
					2020/0399979	A1	12/2020	Webster	
					2020/0400003	A1	12/2020	Webster	
					2020/0400130	A1	12/2020	Poehls	
					2020/0400132	A1	12/2020	Kumar	
					2020/0400140	A1	12/2020	Bayyouk	
					2020/0400242	A1	12/2020	Spencer	

(56) **References Cited**

U.S. PATENT DOCUMENTS

2021/0010113	A1	1/2021	Qiao	
2021/0010470	A1*	1/2021	Blume	F04B 1/0452
2021/0017830	A1	1/2021	Witkowski	
2021/0017982	A1	1/2021	Bayyouk	
2021/0017983	A1	1/2021	Myers	
2021/0040836	A1*	2/2021	Baskin	E21B 4/003
2021/0054486	A1	2/2021	Kim	
2021/0102630	A1	4/2021	Nowell	
2021/0130936	A1	5/2021	Wu	
2021/0148471	A1	5/2021	Murugesan	
2021/0180156	A1	6/2021	Kim	
2021/0190053	A1	6/2021	Wagner	
2021/0190223	A1	6/2021	Bayyouk	
2021/0197524	A1	7/2021	Maroli	
2021/0215071	A1	7/2021	Oikawa	
2021/0215154	A1*	7/2021	Nowell	F04B 1/0408
2021/0230987	A1	7/2021	Tanner	
2021/0239111	A1	8/2021	Zitting	
2021/0246537	A1	8/2021	Maroli	
2021/0260704	A1	8/2021	Hu	
2021/0270261	A1	9/2021	Zhang	
2021/0285551	A1	9/2021	Renollett	
2021/0310484	A1	10/2021	Myers	
2021/0381504	A1	12/2021	Wagner	
2021/0381615	A1	12/2021	Riedel	
2021/0388832	A1	12/2021	Byrne	

FOREIGN PATENT DOCUMENTS

CN	102410194	4/2021
EP	0 414 955	3/1991

OTHER PUBLICATIONS

KerrPumps, "Super Stainless Steel Better Than The Best," http://kerrpumps.com/superstainless?gclid=EAlalQobChMlg47o482q6wIvITich2XPA-qEAYASAAEgKrxPD_BwE, 2013, last accessed: Aug. 21, 2020, 6 pages.

U.S. Appl. No. 16/814,267, 194 pages.

U.S. Appl. No. 17/120,121, 110 pages.

U.S. Appl. No. 62/234,483, 45 pages.

U.S. Appl. No. 62/315,343, 41 pages.

U.S. Appl. No. 62/318,542, 44 pages.

U.S. Appl. No. 62/346,915, 41 pages.

U.S. Appl. No. 62/379,462, 24 pages.

"Flush Free Sealing Benefits," Oct. 3, 2011, <http://empoweringpumps.com/flush-free-sealing-benefits/>, accessed May 9, 2020, 5 pages.

Gardner Denver, Well Servicing Pump Model GD-3000—Operating and Service Manual, Apr. 2011, 44 pages.

Gardner Denver, Well Servicing Pump Model GD-1000Q—Fluid End Parts List, Sep. 2011, 24 pages.

Gardner Denver, Well Servicing Pump Model HD-2250—Operating and Service Manual, Jan. 2005, 44 pages.

Gardner Denver, GD 2500Q HDF Frac & Well Service Pump, 2 pages.

Gutting Tool Engineering, "Groove milling," Aug. 1, 2012, <https://www.ctemag.com/news/articles/groove-milling>, accessed May 13, 2020, 11 pages.

VargusUSA, "Groovex Innovative Grooving Solutions—Groove Milling," Dec. 12, 2011, <http://www.youtube.com/watch?v=vrFxHJUXjvk>, 68 pages.

Kerr Pumps, Kerr KA-3500B/KA-3500BCB Plunger Pump Parts and Service Manual, 41 pages.

Kerr Pumps, Kerr KD-1250B/KD-1250BCB Plunger Pump Service Manual, 38 pages.

Kerr Pumps, Kerr KJ-2250B and KJ-2250BCB Plunger Pump Service Manual, 38 pages.

Kerr Pumps, Kerr KM-3250B / KM-3250BCB Plunger Pump Service Manual, 35 pages.

Kerr Pumps, Kerr KP-3300B / KP-3300BCB Plunger Pump Service Manual, 41 pages.

Kerr Pumps, Kerr KT-3350B/BCB KT-3400BCB Plunger Pump Service Manual, 46 pages.

Kerr Pumps, Kerr triplex pump km3250bcb 10,000 psi @ 5.1 gmp, Feb. 2, 2021, <http://imged.com/kerr-triplex-pump-km3250bcb-10-000-psi-5-1-gmp-8234739.html>, 2 pages.

Lex Machina, 77 Federal district court cases for Alan D Albright of W.D. Tex., http://law.lexmachina.com/court/txwd/udge/5198506/cases?status=open&filed_on-from=2020-02-19&filed_on-to=2020-04-19&pending-, 7 pages.

Lex Machina, Motion Metrics Report for 834 orders issued by District Judge Alan D Albright (ADA) in 1,603 cases from the Search for federal district court cases before Judge Alan D Albright, https://law.lexmachina.com/motions/motion_metrics?cases_key=yyix9Y8-k2k, generated on Sep. 23, 2020, 1 page.

Lex Machina, 6:20-cv-00200-ADA, *Kerr Machine Co. v. Vulcan Industrial Holdings, LLC* Docket Entries, <https://law.lexmachina.com/cases/2004206451#docket-entries>, 6 pages.

Jonathan Maes, "Machining Square Inside Corners: Conquer the Nightmare!," accessed Sep. 8, 2020, <https://makeitfrommetal.com/machining-square-inside-corners-the-night->, 22 pages.

Ross Mackay, "Process Engineering: Properly seal that pump," May 17, 2005, <https://www.chemicalprocessing.com/articles/2005/465>, 11 pages.

MSI Fluid End Components, <https://www.scribd.com/document/421304589/Fluid-End>, 1 page.

MSI Dixie Iron Works, Ltd., Msi QI-1000 Technical Manual for 1000 HP Quintuplex Msi QI-1000 Pump, Feb. 21, 2004, 90 pages.

MSI, Product Listing and Pricing, accessed Mar. 8, 2016, 19 pages.

National Oilwell Varco, 267Q-6M Quinuplex Plunger Pump: Parts List, Jul. 21, 2008, 13 pages.

Oil and Gas Well Servicing, Audit Procedures for Oil and Gas Well Servicing, May 2010, Texas Comptroller of Public Accounts, Audit Division, 68 pages.

Tony Atkins and Marcel Escudier, Oxford Dictionary of Mechanical Engineering, Oxford University Press, 2013, 10 pages.

Parker Hannifin Corporation and Autoclave Engineers, Technical Information, 2016, 16 pages.

Girdhar, Moniz and Mackay, "Chapter 5.4 Centrifugal pump design," Plant and Process Engineering 360, 2010, pp. 519-536.

Parker Hannifin Corporation, PolyPak Seals for Hydraulic Applications Catalog EPS 5370_PolyPak, 2015, 38 pages.

Paresh Girdhar and Octo Moniz, "Practical Centrifugal Pumps—Design, Operation and Maintenance," Newnes, 2005, 33 pages.

Reinhard Preiss, "Stress concentration factors of flat end to cylindrical shell connection with a fillet or stress relief groove subjected to internal pressure," 1997, Int. J. Pres. Ves & Piping, vol. 73, pp. 183-190.

Caterpillar, WS255 Quintuplex Well Stimulation Pump, 2 pages.

Gardner Denver Pumps, Redline Series Brochure, 3 pages.

Eaton Aerospace Group, Resilient Metallic Seals, TF100-35D, Oct. 2013, 60 pages.

Scott McKeown, "District Court Trial Dates Tend to Slip After PTAB Discretionary Denials—Patents Post-Grant," Jul. 24, 2020, Ropes & Gray, accessed Sep. 23, 2020, 3 pages.

Ricky Smith and R. Keith Mobley, "Rules of Thumb for Maintenance and Reliability Engineers—Chapter 14: Packing and Seals," Elsevier, 2008, pp. 239-250.

Schlumberger, Jet Manual 02—Reciprocating Pumps, Aug. 7, 2015, 63 pages.

Schlumberger, Treating Equipment Manual: Fluid Ends, Section 10, Apr. 2000, 87 pages.

SPM Oil & Gas, SPM QEM 3000 Frac Pump, 2021, 4 pages.

Supplemental Declaration of Steven M. Tipton, Ph.D., P.E.—Case PGR2020-00065, U.S. Pat. No. 10,591,070, Mar. 2, 2021, 35 pages.

Servagroup, TPD 600 Triplex Pump Brochure, Mar. 24, 2011, 2 pages.

Utex Industries, Inc., Well Service Products Catalog, Jun. 2017, 51 pages.

Utex Industries, Inc., Well Service Packing—Packing Assemblies Complete & Replacement, May 2013, 40 pages.

(56)

References Cited

OTHER PUBLICATIONS

Vargus Ltd., Groove Milling High Precision Tools for Groove Milling, Dec. 2012, pp. 2-22.

Flowserve, “Dynamic Balance Plug Valve and Double DB Plug Valve: Installation, Operation and Maintenance,” 2011, https://www.flowserve.com/sites/default/files/2016-07/NVENIM2005-00_0.pdf, 36 pages.

Weir Oil & Gas, “SPM Well Service Pumps & Flow Control Products TWS600S Fluid End Operation Instruction and Service Manual,” Feb. 27, 2017, <https://www.global.weir/assets/files/oil%20and%20gas%20brochures/manuals/tws600s-fluid-end-2p121260.pdf>, 41 pages.

White Star Pump Co., “Maintenance Manual: Triplex Pump WS-1300/1600,” 2005, http://www.whitestarpump.com/ES/Jocs/user_tpdf, 45 pages.

Kerrpumps, “Super Stainless Steel Better Than The Best,” http://kerrpumps.com/superstainless?gclid=EAlalQobChMlg47o482q6wIViITich2XPA-qEAAAYASAAEgKrxPD_BwE, 2013, last accessed: Aug. 21, 2020, 6 pages.

Kerrpumps, “Frac One Pumps—Fluid End—Fracing,” <http://kerrpumps.com/fracone>, 2013, last accessed: Aug. 21, 2020, 3 pages.

Kerrpumps, “KerrPumps—Frac Pump & Mud Pump Fluid End—Fluid End Pump,” <http://kerrpumps.com/fluidends>, 2013, last accessed: Aug. 21, 2020, 6 pages.

Vulcan Industrial, “Vulcan,” <http://www.vulcanindustrial.com/>, 2019, last accessed: Aug. 21, 2020, 3 pages.

Vulcan Industrial, “Vulcan,” <http://www.vulcanindustrial.com/fluid-ends/>, 2019, last accessed: Aug. 21, 2020, 3 pages.

Covert Manufacturing, Inc., “Fluid End Block: Covert Manufacturing,” (site visited Jul. 30, 2021), www.covertmfg.com/our-capabilities/fluid-end-block/ (Year: 2021).
Kerr Pumps, “the most advanced fluid ends,” (site visited Aug. 5, 2021), [kerrpumps.com](http://kerrpumps.com/fluidends), URL: <http://kerrpumps.com/fluidends> (Year: 2021).

Shandong Baorun, 2250 Triplex Plunger Pump Fluid End Exchangeable with Spm, (site visited Aug. 5, 2021), made-in-china.com, URL: <https://sdbaorun.en.made-in-china.com/product/wNixlDXYrshL/China-2250-Triplex-Plunger-Pump-Fluid-End-Exchangeable-with-Spm.html> (Year: 2021).

John Miller, “The Reciprocating Pump, Theory, Design and Use,” 1995, 2nd Edition, Krieger Publishing Company, Malabar, Florida, 1 page.

“QIH-1000 HP Quintuplex,” Dixie Iron Works, 2017, <https://web.archive.org/web/20171031221150/http://www.diwmsi.com/pumping/qi-1000/>.

Technical Manual MSI Hybrid Well Service Pump Triplex and Quintuplex Models, Dixie Iron Works, Mar. 12, 2019, 88 pages. <https://www.diwmsi.com/pumping/qi-1000/>.

Carpenter, “CarTech Ferrium C61 Data Sheet,” 2015, 2 pages.

The American Heritage Dictionary, Second College Edition, 1982, 6 pages.

Matthew Bultman, “Judge in West Texas Patent Hot Spot Issues Revised Guidelines,” Sep. 23, 2020, Bloomberg Law News, 3 pages.

David L. Taylor, “Machine Trades Blueprint Reading: Second Edition,” 2005, 3 pages.

Blume, U.S. Pat. No. 6,544,012, issued Apr. 8, 2003, Fig. 12A.

Caterpillar, “Cat Fluid Ends For Well Stimulation Pumps,” 2015, 2 pages.

Claim Chart for U.S. Pat. No. 6,544,012, 23 pages.

Claim Chart for U.S. Pat. No. 7,186,097, 22 pages.

Claim Chart for U.S. Pat. No. 7,845,413, 8 pages.

Claim Chart for U.S. Pat. No. 9,534,472, 8 pages.

Claim Chart for U.S. Pat. Pub. No. 2013/0319220, 17 pages.

Claim Chart for U.S. Pat. Pub. No. 2014/0348677, 10 pages.

Claim Chart for U.S. Pat. Pub. No. 2015/0132157, 23 pages.

Claim Chart for “GD-3000,” 9 pages.

Claim Chart for “NOV-267Q,” 14 pages.

Collins English Dictionary, “annular,” <https://www.collinsdictionary.com/us/dictionary/english/annular>, 2021, 4 pages.

Collins English Dictionary, “circumference,” <https://www.collinsdictionary.com/us/dictionary/english/circumference>, 2021, 7 pages.

Collins English Dictionary, “plug,” <https://www.collinsdictionary.com/us/dictionary/english/plug>, 2021, 17 pages.

Collins English Dictionary, “profile,” <https://www.collinsdictionary.com/us/dictionary/english/profile>, 2021, 10 pages.

Collins English Dictionary, “sleeve,” “Therethrough,” “through,” “tube,” and “tubular,” 8 pages.

Collins English Dictionary, “space,” <https://www.collinsdictionary.com/us/dictionary/english/space>, 2021, 13 pages.

Collins English Dictionary, “stairstep,” <https://www.collinsdictionary.com/us/dictionary/english/stairstep>, 2021, 3 pages.

Congressional Record—Extensions of Remarks, Apr. 18, 2007, pp. E773-E775.

Congressional Record, Mar. 7, 2011, 31 pages.

“Declaration of Steven M. Tipton, Ph.D., P.E., Submitted with Patent Owner’s Preliminary Response,” Sep. 11, 2020, 155 pages.

“Declaration of William D. Marscher, P.E.—U.S. Pat. No. 10,914,171,” Feb. 11, 2021, 308 pages.

“Declaration of William D. Marscher, P.E.—U.S. Pat. No. 10,591,070,” May 25, 2020, 209 pages.

Email dated Sep. 22, 2020 in PGR2020-00065, 3 pages.

Email dated Sep. 25, 2020 in Kerr Machine v Vulcan Industrial Holdings, 1 page.

U.S. Pat. No. 10,288,178, 353 pages.

U.S. Pat. No. 10,519,950, 142 pages.

U.S. Pat. No. 10,591,070, 168 pages.

U.S. Pat. No. 10,914,171, 104 pages.

U.S. Appl. No. 13/773,271, 250 pages.

U.S. U.S. Appl. No. 15/719,124, 183 pages.

Declaration of Duncan Hall from Internet Archive/Wayback Machine, Feb. 3, 2021, Kerr Plunger Pump Manuals, 20 pages.

Michael Agnes, Editor, Webster’s New World College Dictionary, Fourth Edition, 1999, 5 pages.

Weir SPM Oil & Gas, Grooveless Fluid End, 2008, 1 page.

Weir SPM Oil & Gas, Weir SPM General Catalog, 2009, 40 pages.

Weir SPM Oil & Gas, Well Service Pump Reference Guide, 2008, 55 pages.

Intellectual Ventures I LLC v VMware, Inc., Case No. 1:19-CV-01075-ADA, Document 91 (W.D. Tex. Jun. 3, 2020), Defendant VMware, Inc.’s Stipulation of Invalidity Contentions for U.S. Pat. No. 7,949,752, Jun. 3, 2020, 5 pages.

Vulcan Industrial Holding, LLC et al. v. Kerr Machine Co. Case No. 4:21-cv-433, Document 1, Complaint for Declaratory Judgment of Patent Non-Infringement, Feb. 9, 2021, 17 pages.

Trilogy Enterprises, Inc., v. Trilogy Education Services, LLC, Case No. 6:19-cv-199-ADA-JCM, Document 35, Fifth Amended Scheduling Order, Sep. 8, 2020, 4 pages.

Dr. Corneliu Bolbocean v Baylor University, Case No. 6:19-CV-00465-ADA-JCM, Document 34, Scheduling Order, Apr. 6, 2020, 4 pages.

Kerr Machine Co., v. Vulcan Energy Services, LLC, Vulcan Industrial Holdings, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:21-CV-00044-ADA, Document 4, Plaintiffs Amended Complaint for Patent nfringement and Jury Demand, Jan. 19, 2021, 30 pages.

Kerr Machine Co., v. Vulcan Energy Services, LLC, Vulcan Industrial Holdings, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:21-CV-00044, Document 1, Plaintiffs Original Complaint for Patent Infringement and Jury Demand, Jan. 19, 2021, 47 pages.

Kerr Machine Co., v. Vulcan Energy Services, LLC, Vulcan Industrial Holdings, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:21-CV-00044-ADA, Document 10, Plaintiffs Second Amended Complaint for Patent Infringement and Jury Demand, Feb. 1, 2021, 88 pages.

Kerr Machine Co., v. Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, Cizion, LLC, Case No. W-20-CV-00200-ADA-24, Order Setting Trial Date, Jun. 14, 2020, 1 page.

(56)

References Cited

OTHER PUBLICATIONS

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, Cizion, LLC, Case No. W-20-CV-00200-ADA-29, Order Setting Trial Date, Aug. 2, 2020, 1 page.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Case No. 6:20-CV-00200-ADA, Affidavit of Service, Apr. 7, 2020, 1 page.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:20-CV-00200-ADA, Plaintiffs First Amended Complaint for Patent Infringement and Jury Demand, Jun. 4, 2020, 11 pages.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:20-CV-00200-ADA, Document 26, Defendant Cizion, LLC d/b/a Vulcan Industrial Manufacturing, LLC's Motion to Dismiss or Transfer, Jul. 22, 2020, 10 pages.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:20-CV-00200-ADA, Defendants' Opposed Motion to Stay Litigation Pending the Outcome of the Pending Post-Grant Review Proceeding Before the Patent Trial and Appeal Board, Jul. 31, 2020, 14 pages.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Case No. 6:20-CV-00200-ADA, Plaintiffs Preliminary Infringement Contentions, May 22, 2020, 50 pages.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:20-CV-00200-ADA, Defendants' Preliminary Invalidity Contentions, Aug. 13, 2020, 29 pages.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:20-CV-00200-ADA, Document 34, Scheduling Order, Aug. 11, 2020, 3 pages.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:20-CV-00200-ADA, Document 38, Plaintiffs Second Amended Complaint for Patent Infringement and Jury Demand, Sep. 25, 2020, 11 pages.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:20-CV-00200-ADA, Document 5, Standing Order regarding Scheduled Hearings in Civil Cases in Light of Chief Judge Garcia's 24 Amended Order, Mar. 24, 2020, 4 pages.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Civil Docket for Case No. 6:20-cv-00200-ADA, accessed Sep. 11, 2020, 7 pages.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial

Manufacturing, Case No. 6:20-CV-00200-ADA, Document 54, Claim Construction Order, Dec. 3, 2020, 3 pages.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Vulcan Energy Services, LLC, and Cizion, LLC d/b/a/ Vulcan Industrial Manufacturing, Case No. 6:20-CV-00200-ADA, Docket Entry, Aug. 2, 2020, 1 page.

Kerr Machine Co., v Vulcan Industrial Holdings, LLC, Case No. 6:20-CV-00200, Document 1, Plaintiffs Original Complaint for Patent Infringement and Jury Demand, Mar. 19, 2020, 39 pages.

Adriana del Rocio Barberena-Rovira, et. al., v Kuiper Dairy, LLC, et al., Case No. 6:20-CV-00250-ADA-JCM, Document 20, Scheduling Order, Jul. 22, 2020, 4 pages.

Acquanlan Deonshay Harris v. Cenlar, FSB, Case No. 6:20-CV-00271-ADA-JCM, Document 13, Scheduling Order, Aug. 20, 2020, 4 pages.

Senior Living Properties, LLC c. Ironshore Speciality, Insurance Company, Case No. 6:20-CV-00282-ADA-JCM, Document 12, Scheduling Order, Jul. 7, 2020, 4 pages.

Dionne Bracken, Individually and as Next Friend of A.M.B., v Michael D. Ashcraft and Envirovac Waste Transport Systems, Inc., Case No. 6:20-CV-00308-ADA-JCM, Document 17, Scheduling Order, Jul. 28, 2020, 4 pages.

Kendra Coufal v. Roger Lee Thomas and Apple Logistics, Inc., Case No. 6:20-CV-00356-ADA-JCM, Document 12, Scheduling Order, Jul. 228, 2020, 4 pages.

Tipton International, Inc., v. Vetizcorp, LLC and Samuel Cody, Case No. 6:20-CV-00554-ADA-JCM, Document 8, Scheduling Order, Jul. 7, 2020, 4 pages.

Dynaenergetics GmbH & Co. KG and Dynaenergetics US, Inc., v. Hunting Titan, Ltd.; Hunting Titan, Inc.; and Hunting Energy Services, Inc., Case No. H-17-3784, Order, Sep. 4, 2020, 2 pages. Slip Opinion, In re Sand Revolution LLC, Case No. 2020-00145 (Fed. Cir. Sep. 28, 2020), 3 pages.

In re Vulcan Industrial Holdings, LLC, Case No. 2020-00151 (Fed. Cir. Sep. 29, 2020), Petition for Writ of Mandamus, 43 pages.

Densys Ltd., v. 3Shape Trios A/S and 3Shape A/S, Case No. WA:19-CV-00680-ADA, Document 27, Scheduling Order, Apr. 8, 2020, 4 pages.

Kerr Machine Co. vs. Vulcan Industrial Holdings, LLC, Case No. WA:20-CV-00200-ADA, Order Setting Markman Hearing, May 29, 2020, 1 page.

U.S. Appl. No. 16/722,139, 104 pages.

Kendra Coufal v. Roger Lee Thomas and Apple Logistics, Inc., Case No. 6:20-CV-00356-ADA-JCM, Document 12, Scheduling Order, Jul. 28, 2020, 4 pages.

Tipton International, Inc., v. Vetbizcorp, LLC and Samuel Cody, Case No. 6:20-CV-00554-ADA-JCM, Document 8, Scheduling Order, Aug. 20, 2020, 4 pages.

* cited by examiner

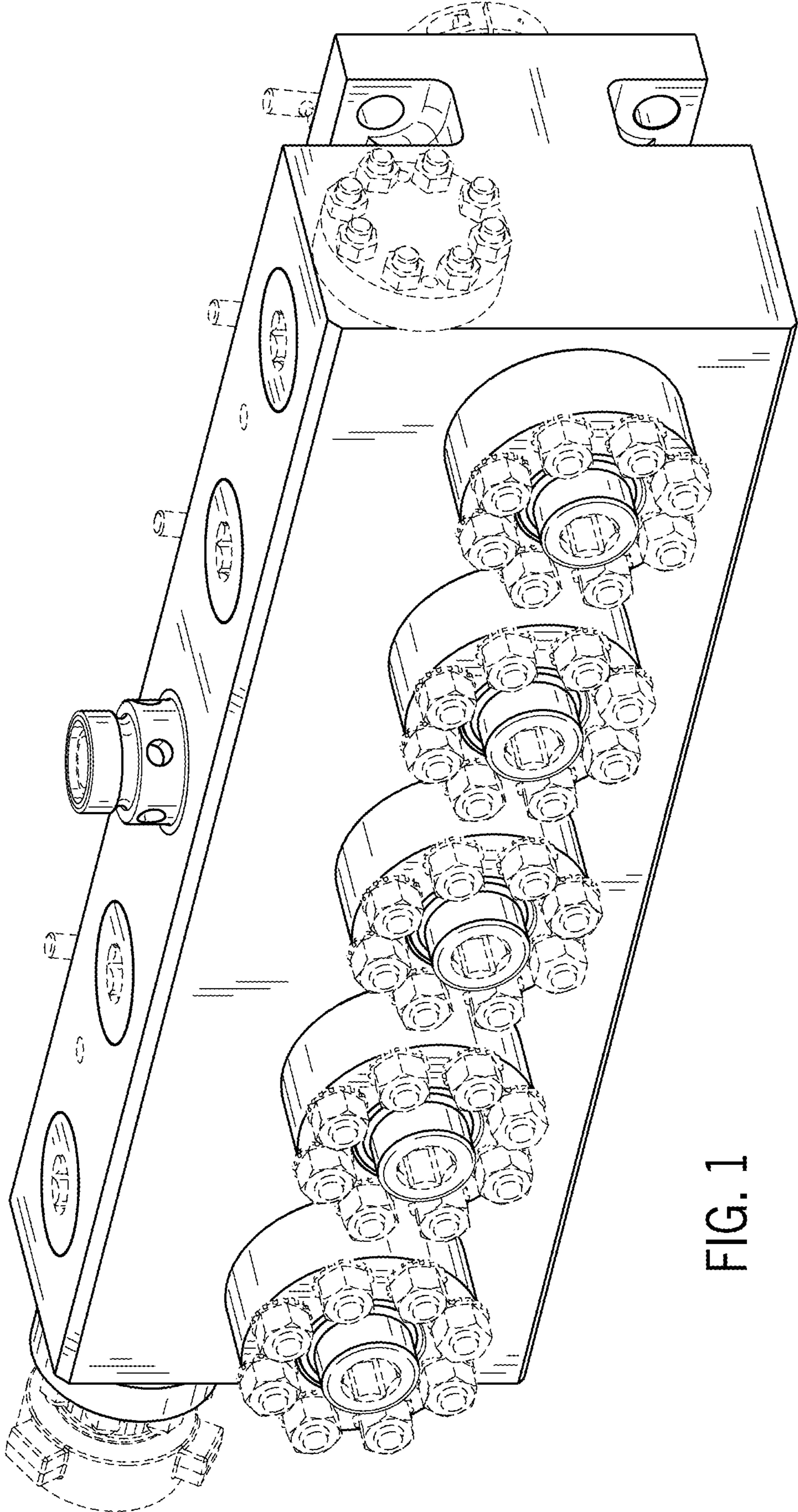


FIG. 1

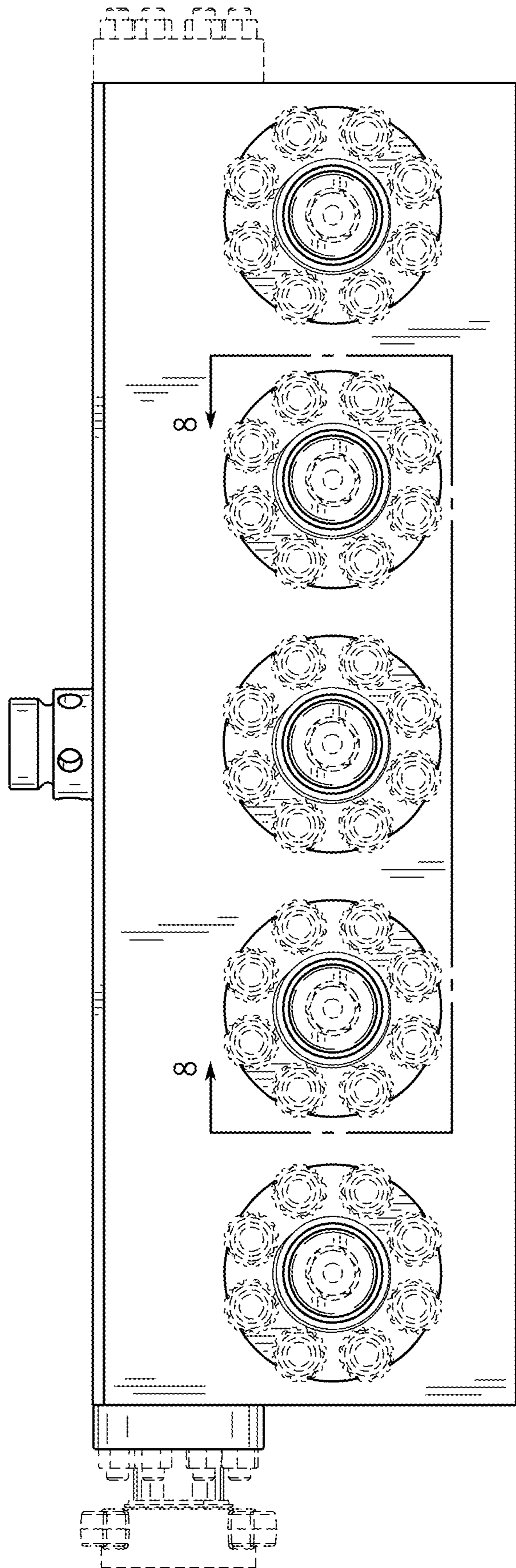


FIG. 2

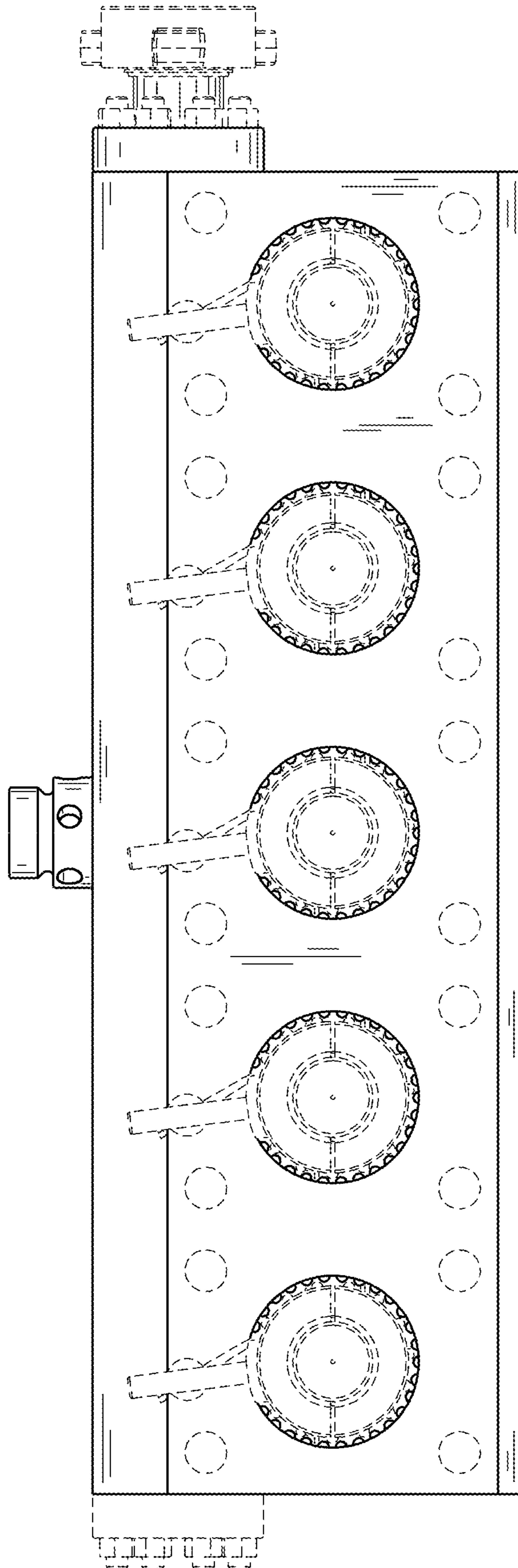


FIG. 3

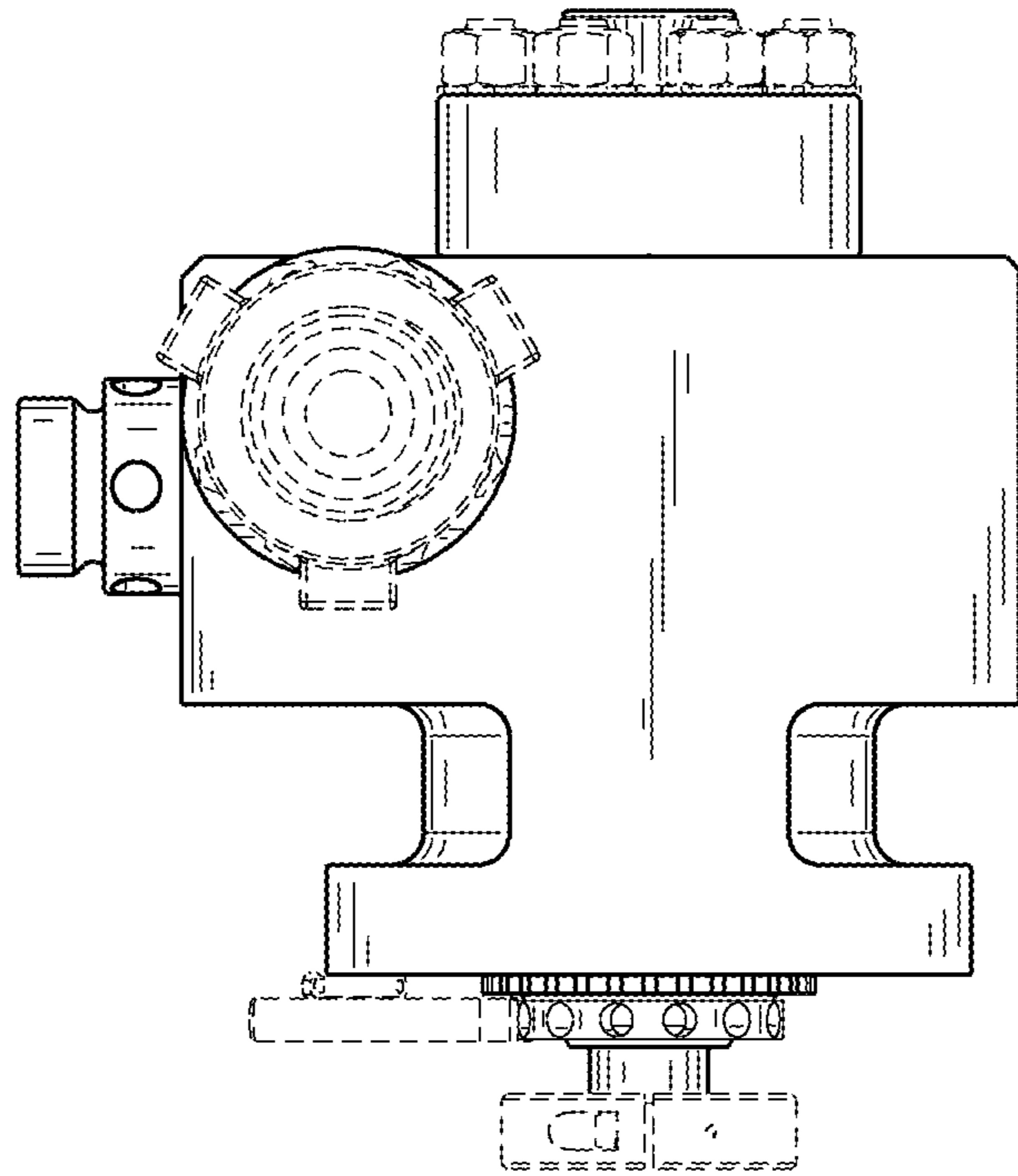


FIG. 5

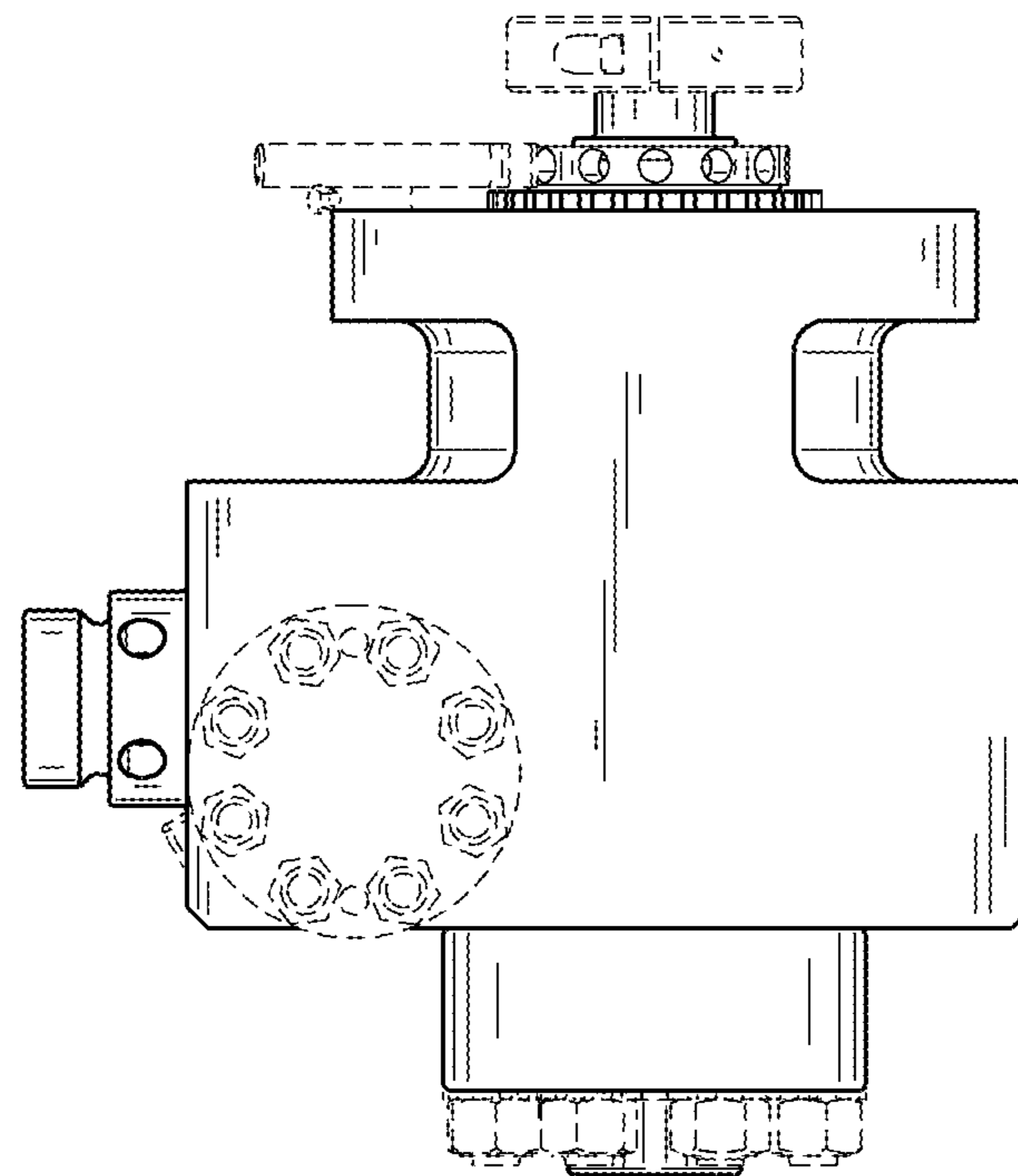


FIG. 4

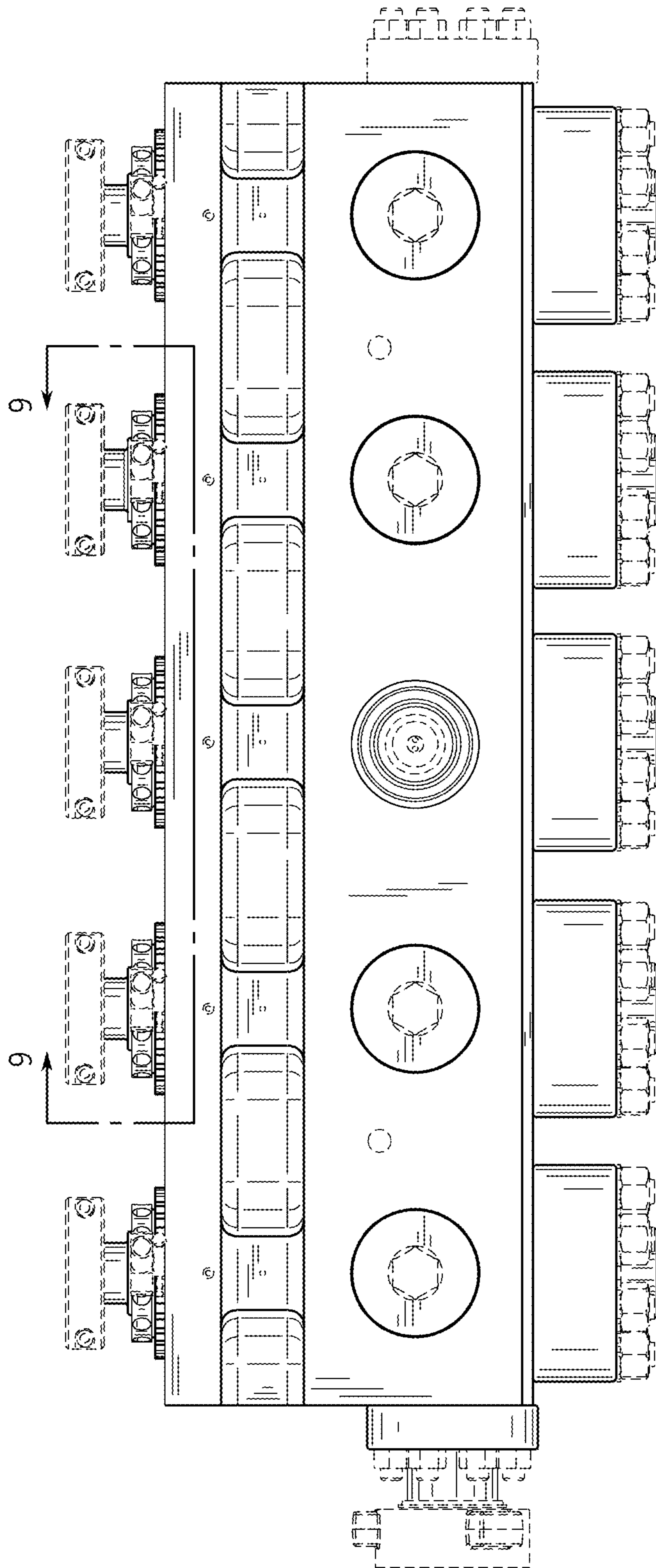


FIG. 6

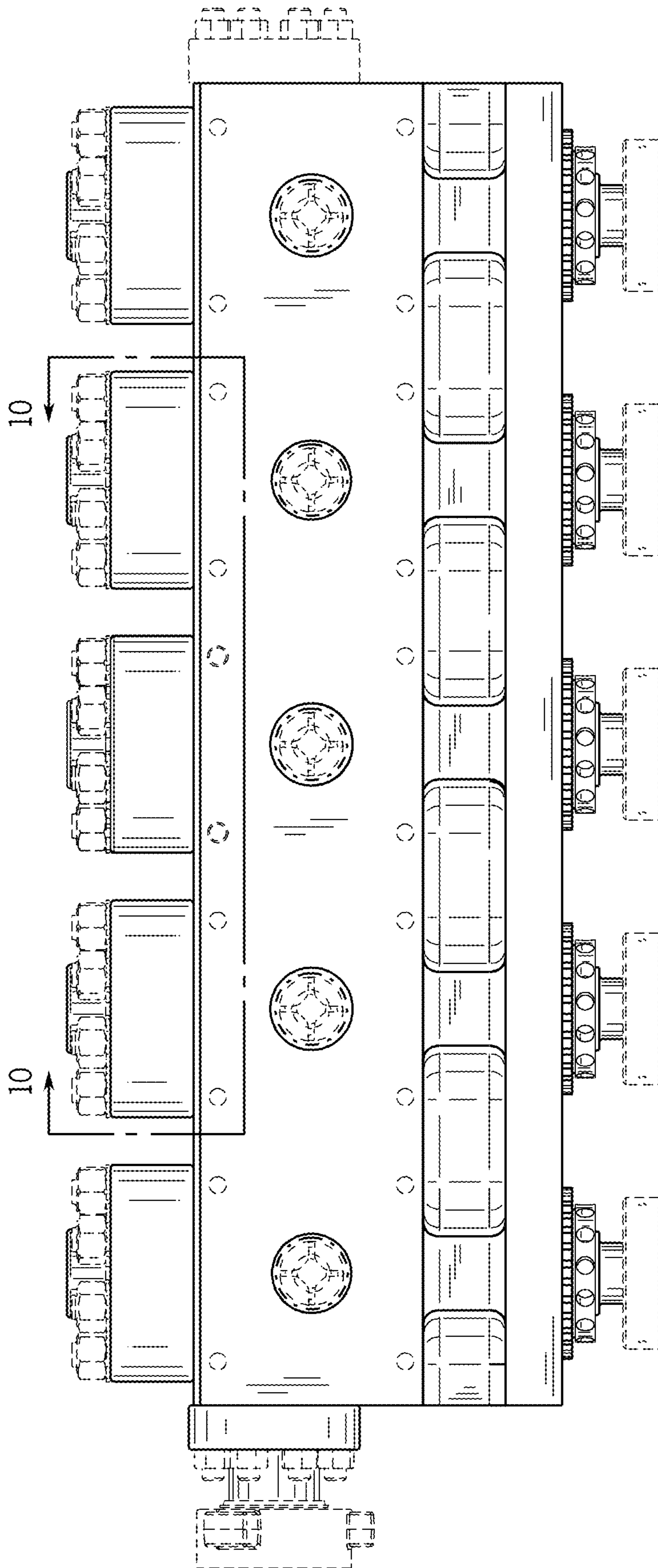


FIG. 7

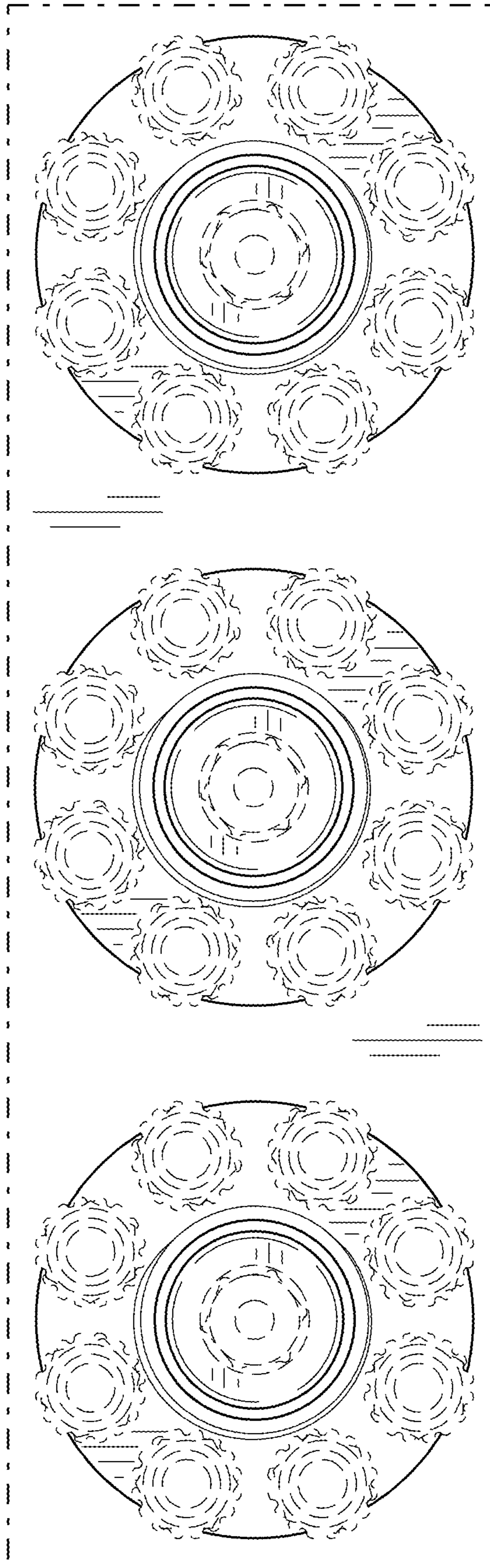


FIG. 8

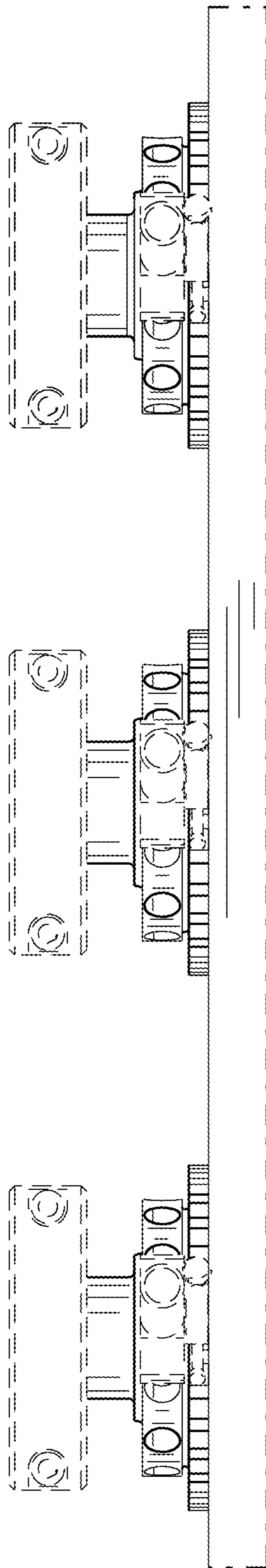


FIG. 9

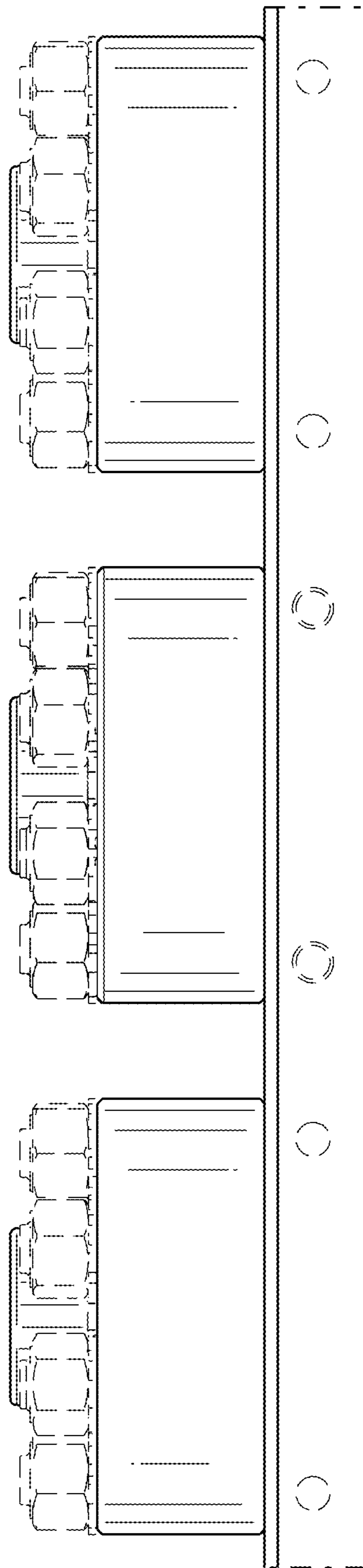


FIG. 10