

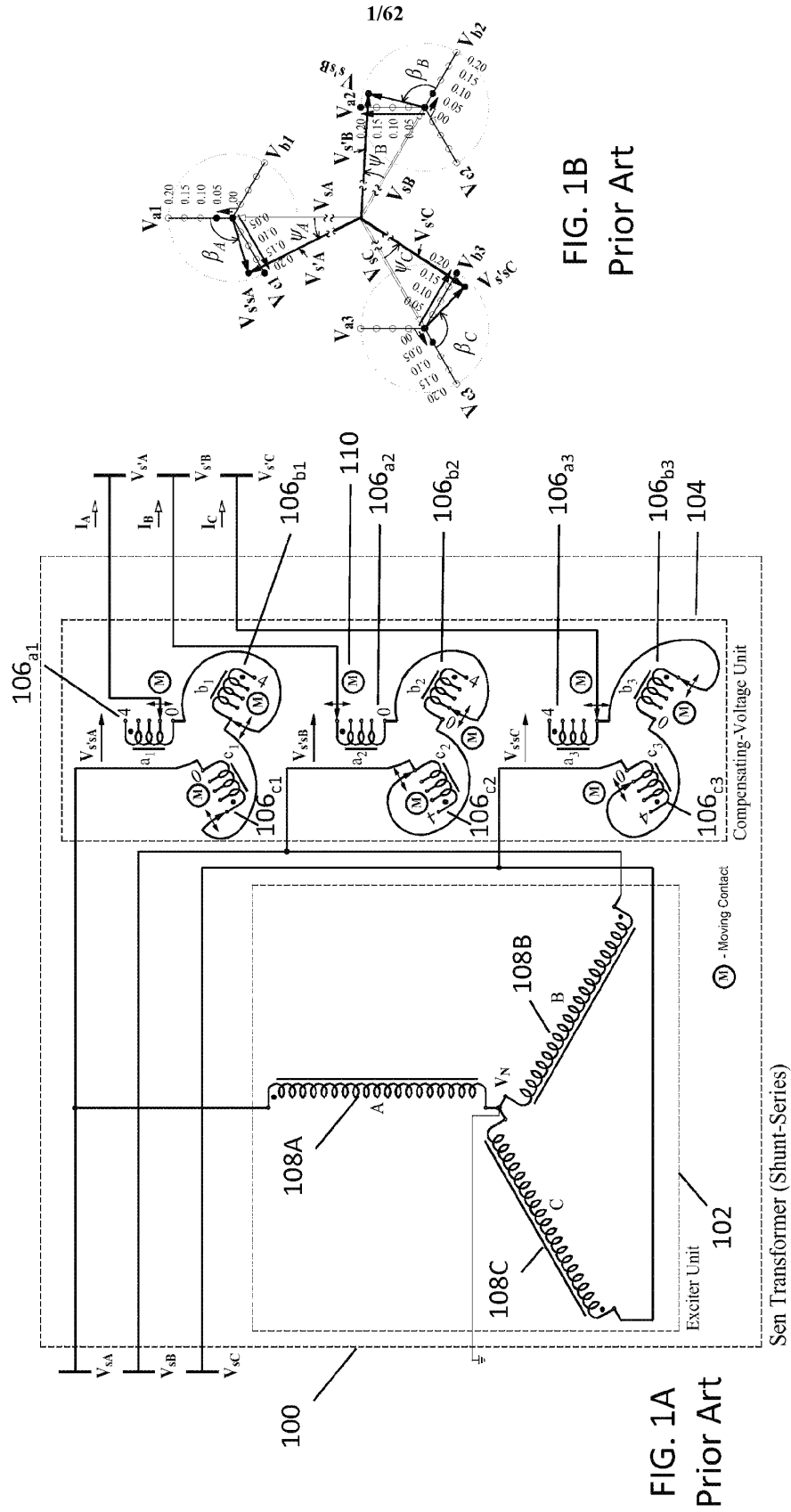


FIG. 1B
Prior Art

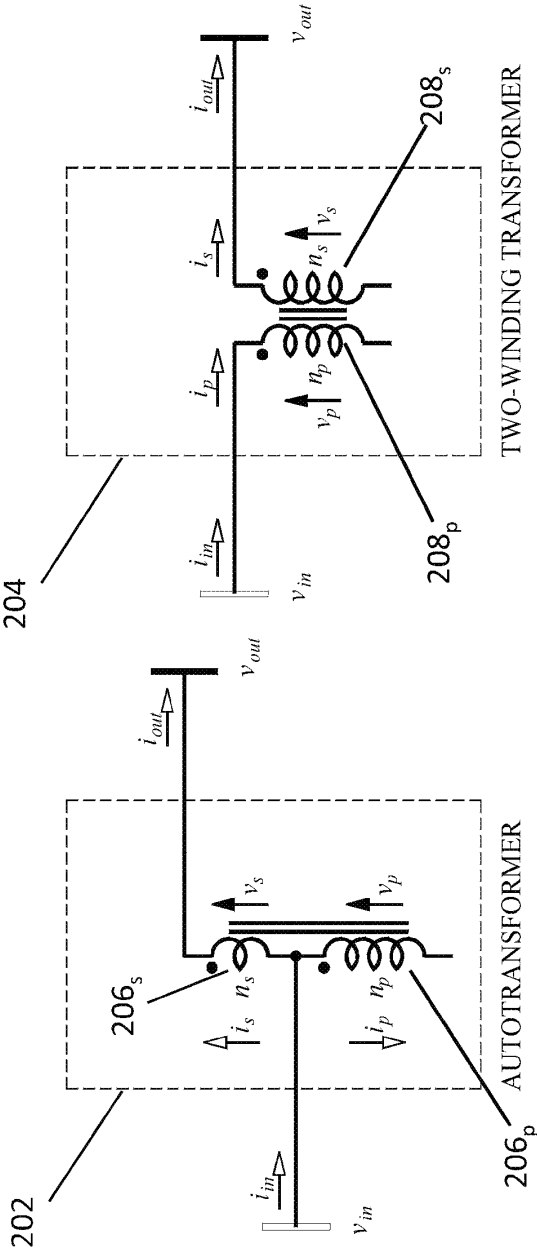


FIG. 2A
Prior Art

FIG. 2B
Prior Art

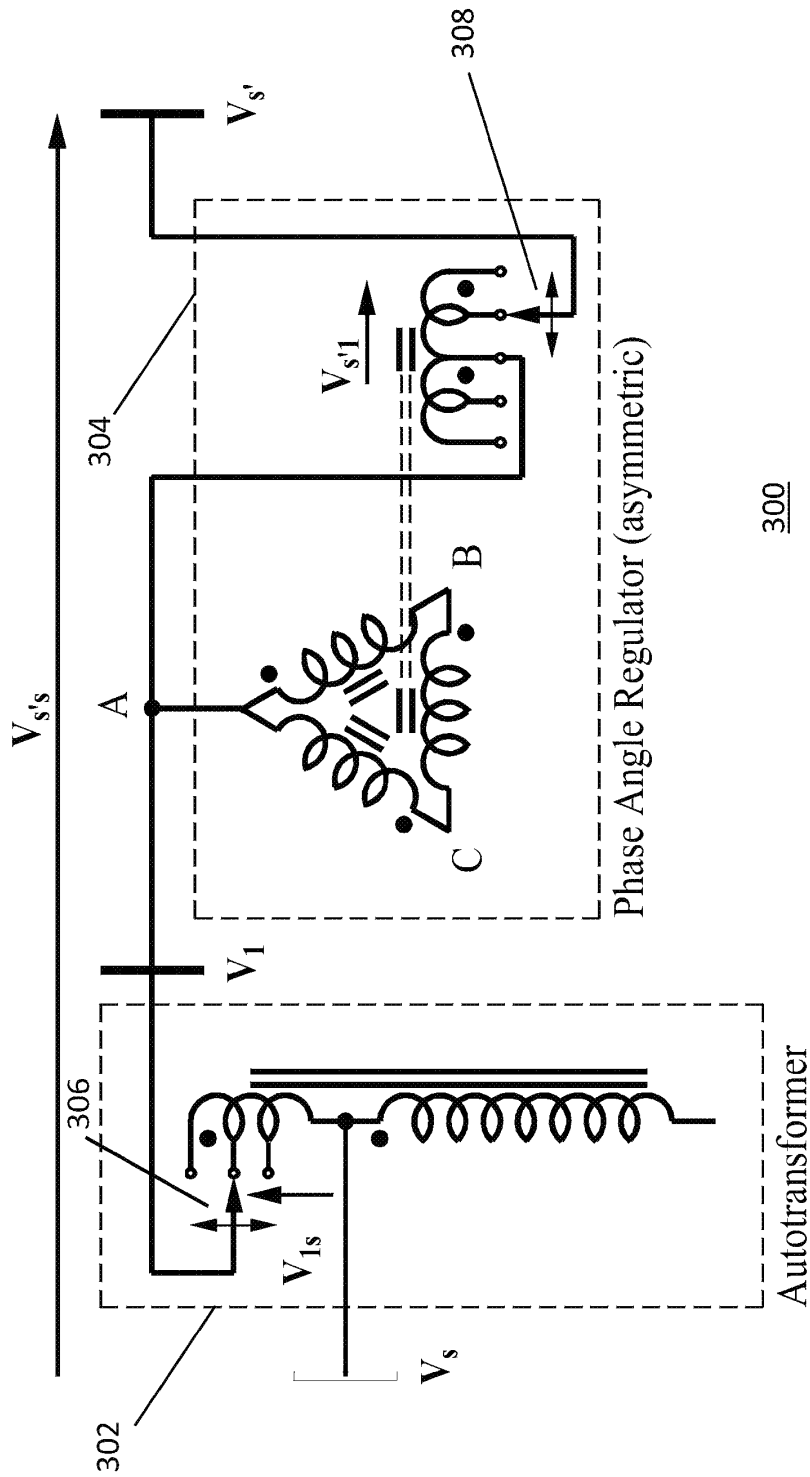


FIG. 3
Prior Art

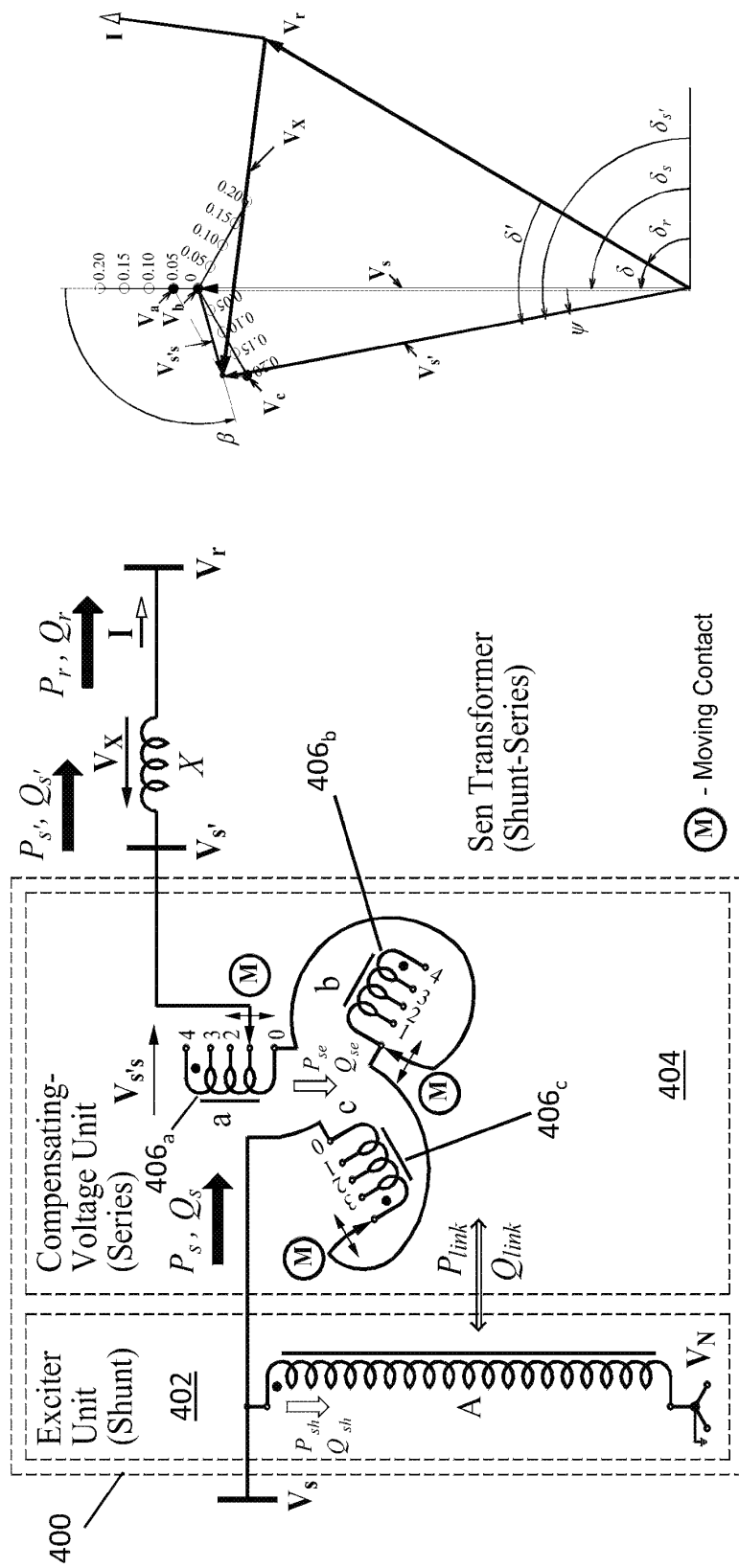
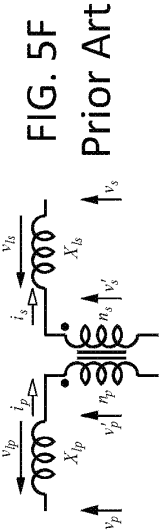
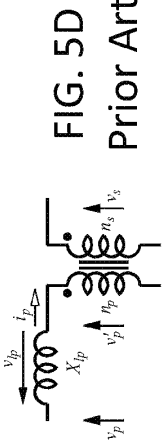
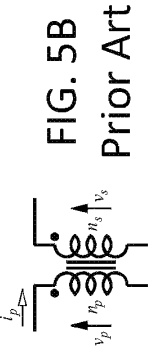
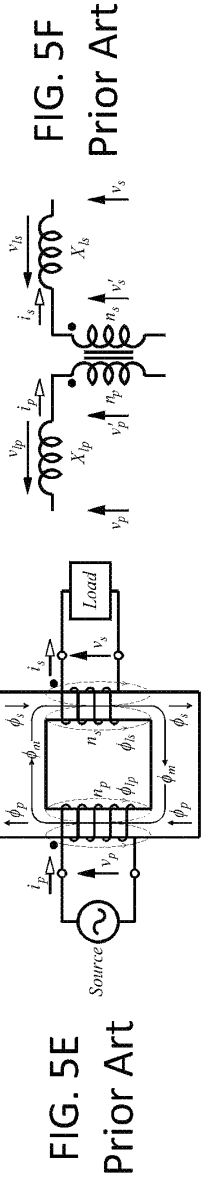
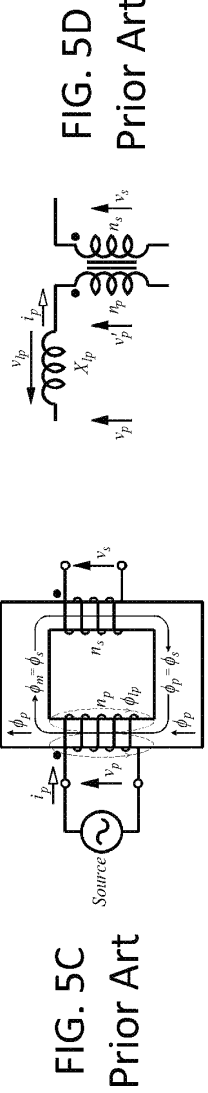
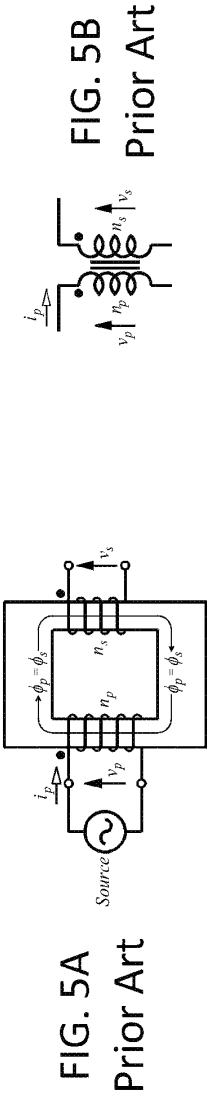


FIG. 4B
Prior Art

FIG. 4A
Prior Art



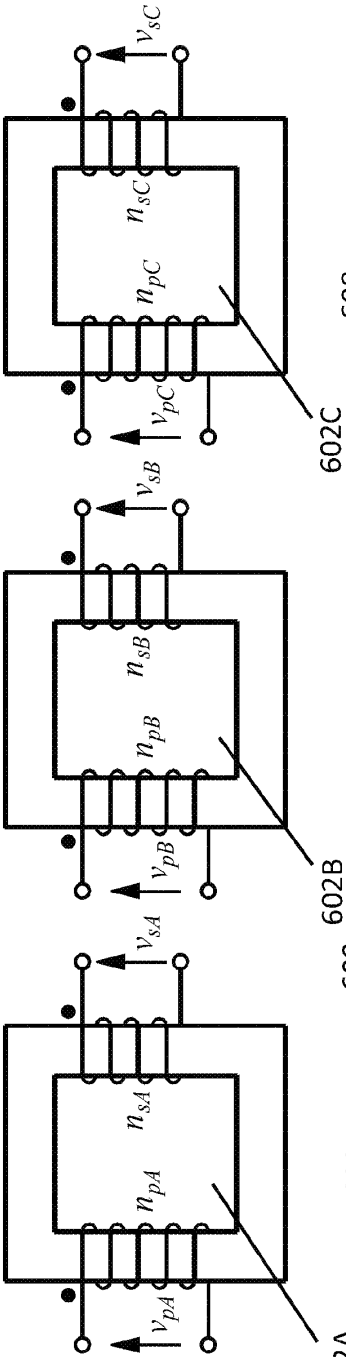


FIG. 6A
Prior Art

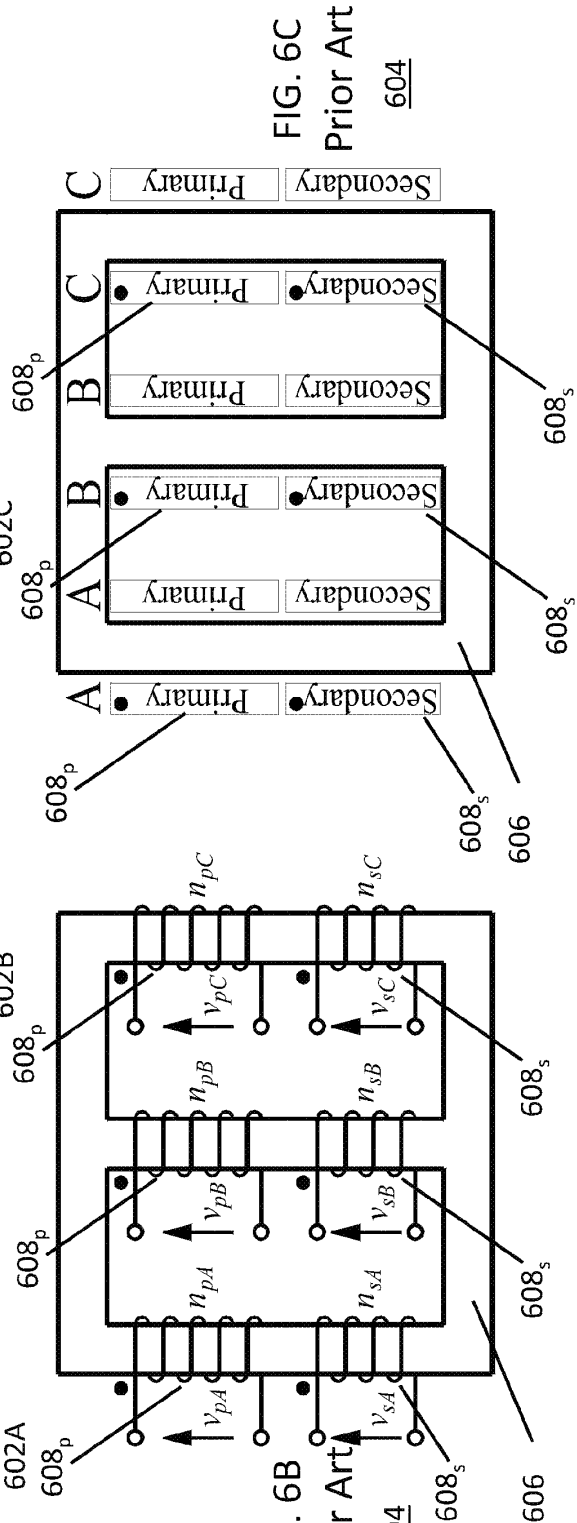


FIG. 6B
Prior Art

FIG. 6C
Prior Art

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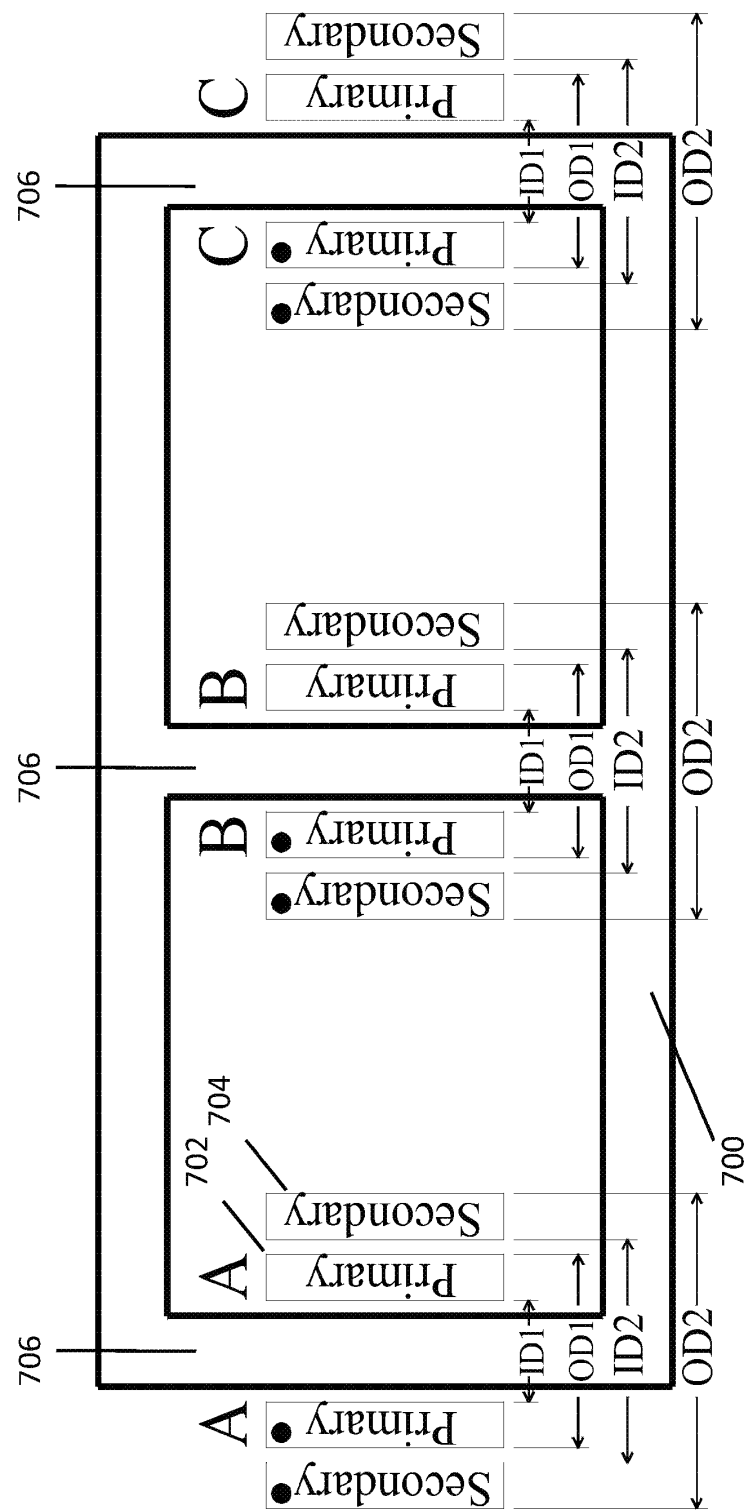


FIG. 7A
Prior Art

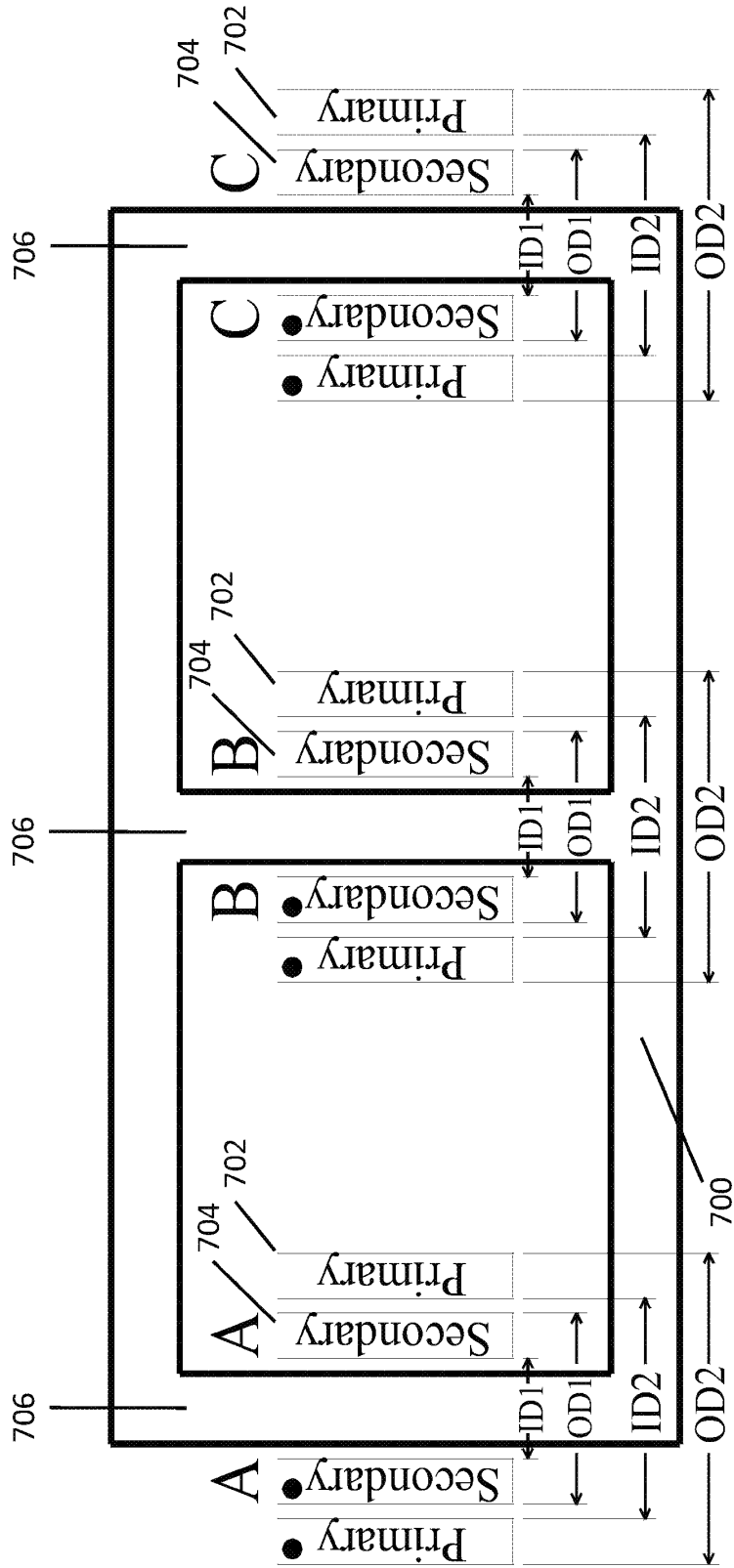
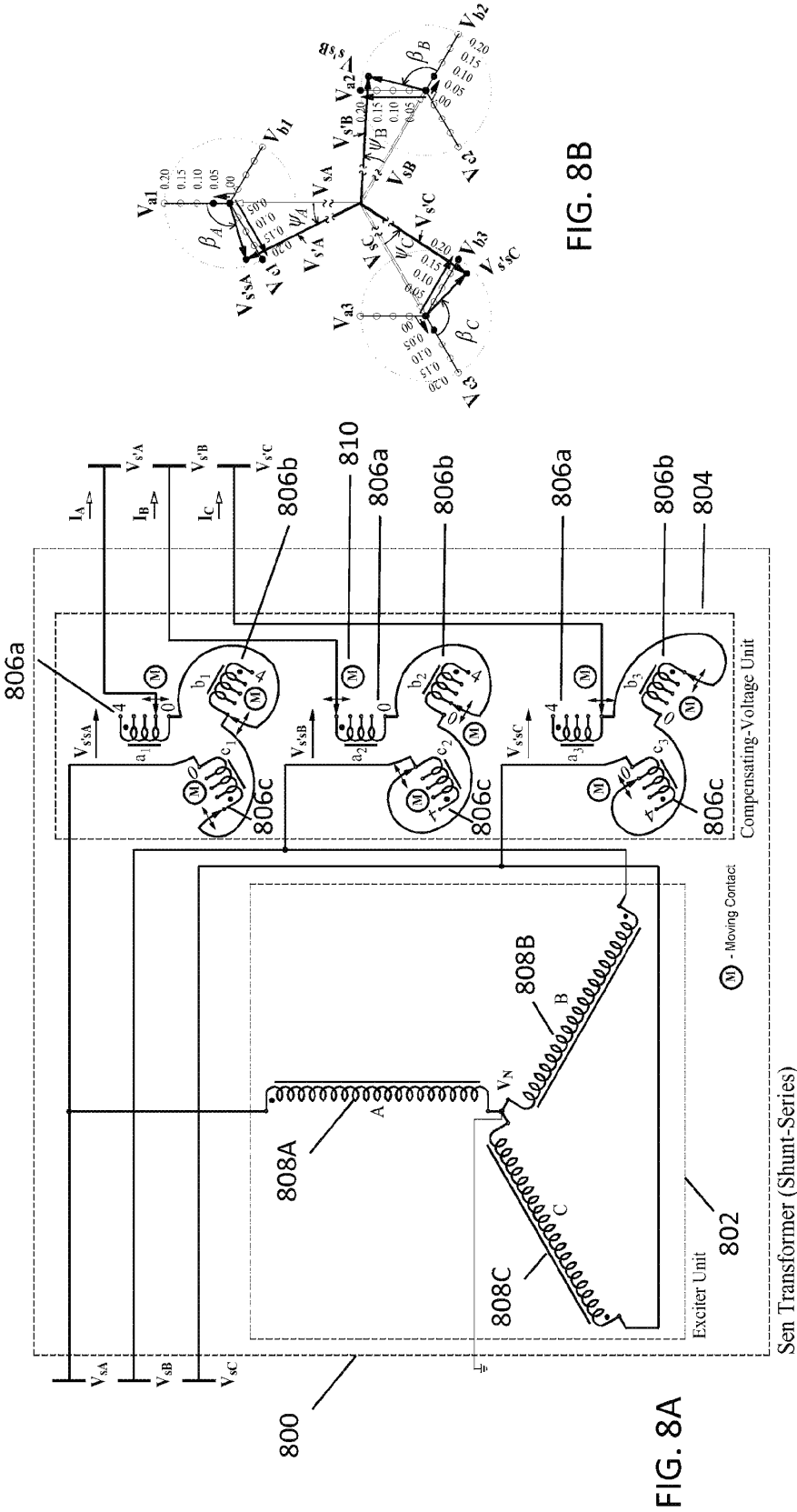


FIG. 7B
Prior Art



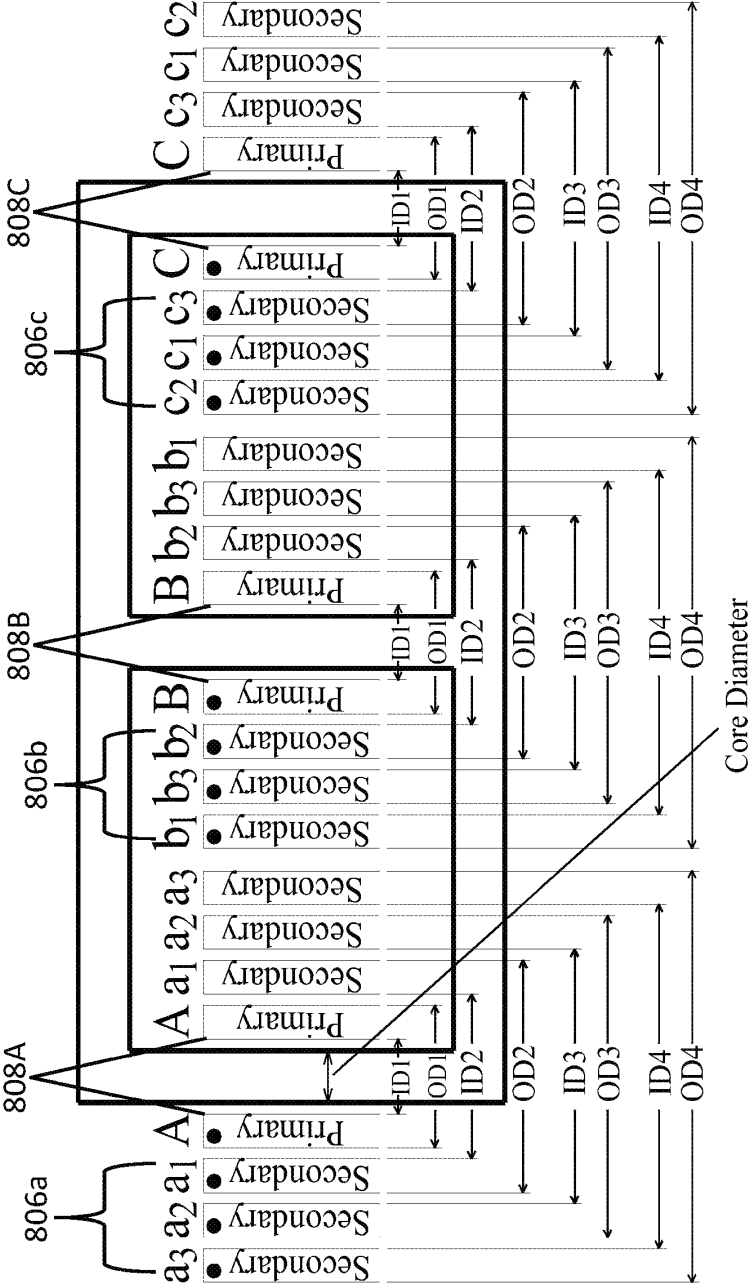


FIG. 8C

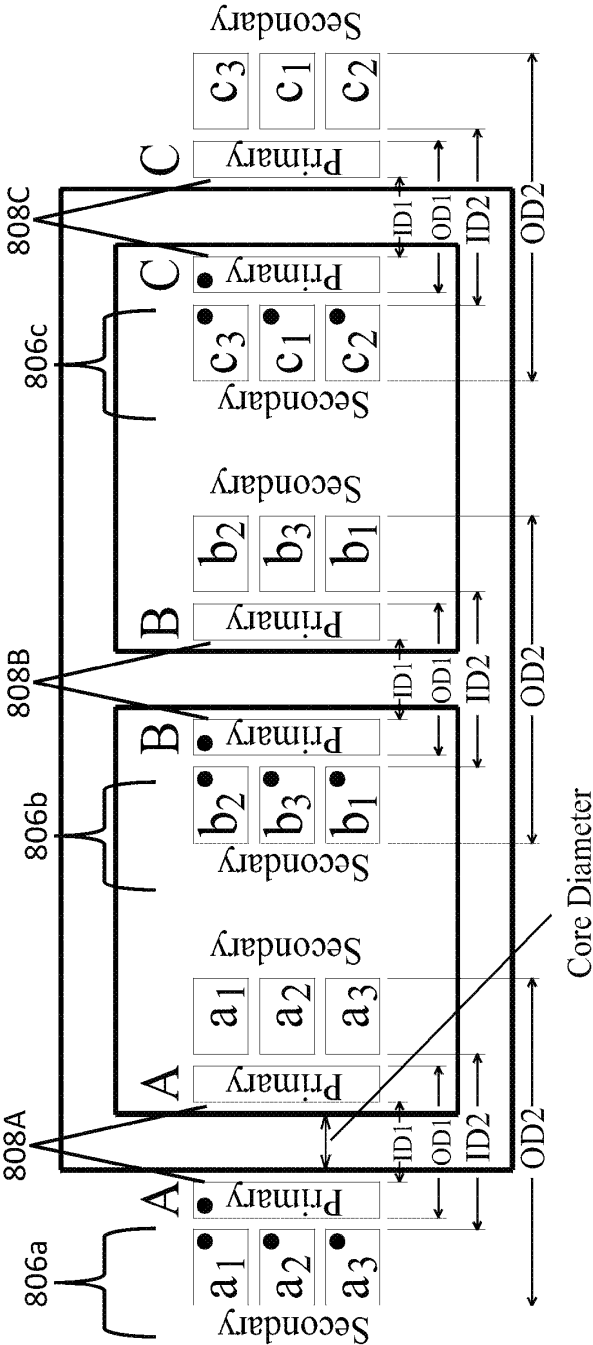


FIG. 8H

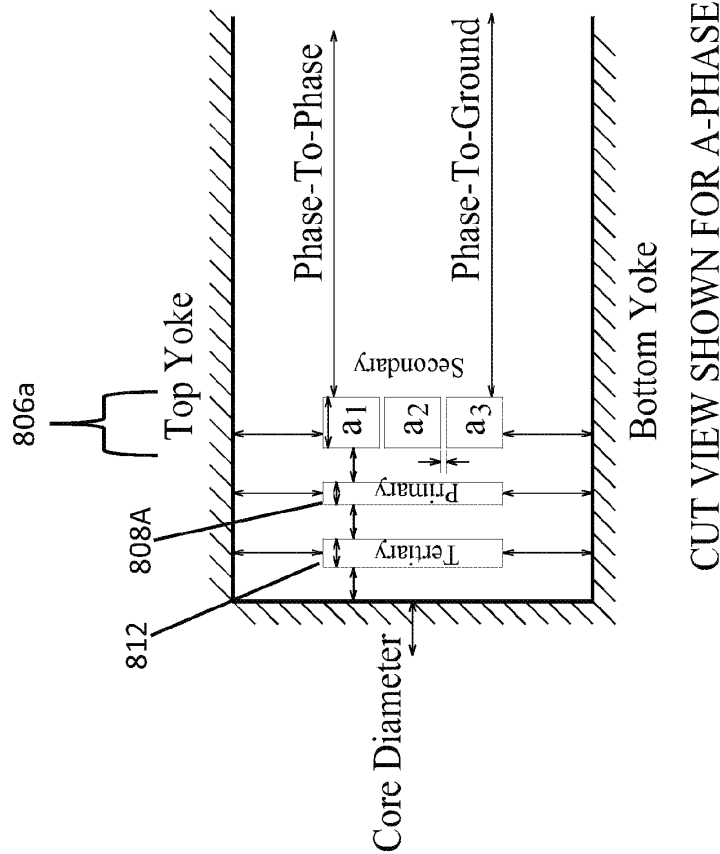


FIG. 8J

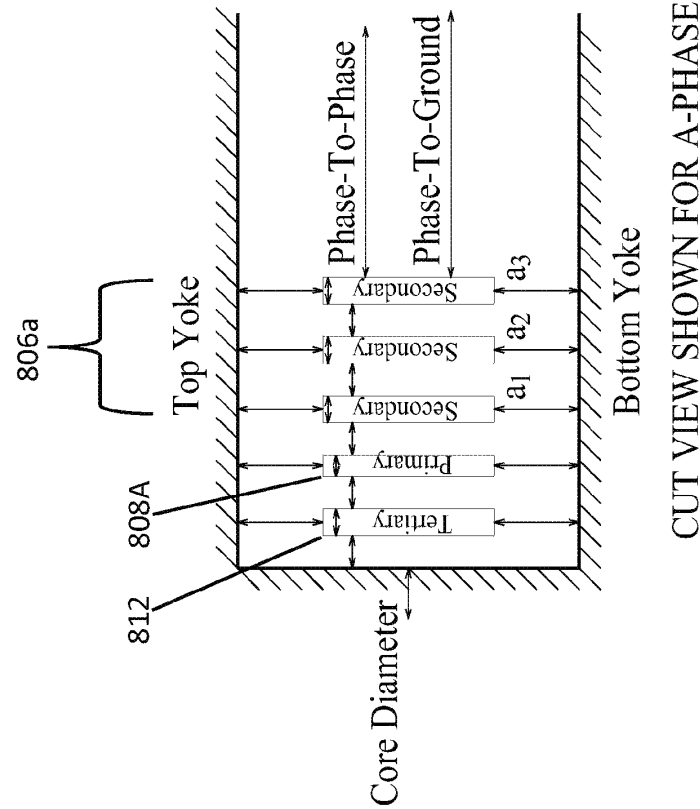


FIG. 8I

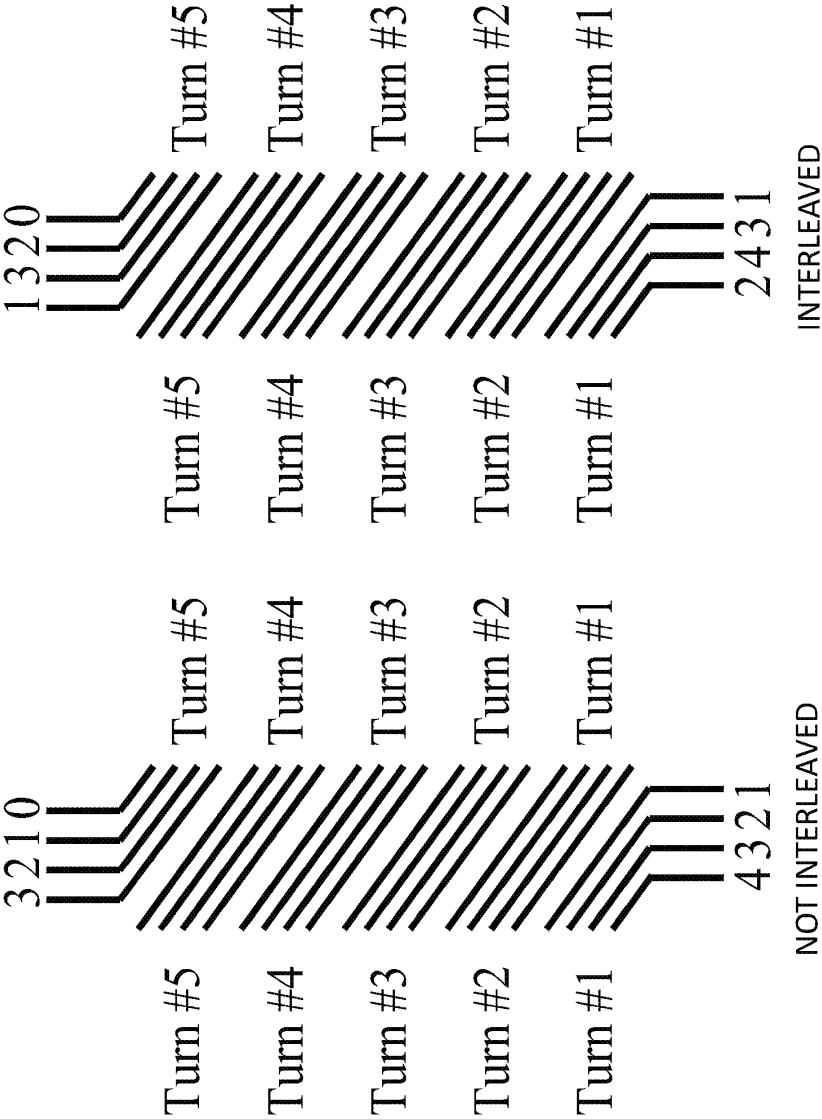


FIG. 8L

FIG. 8K

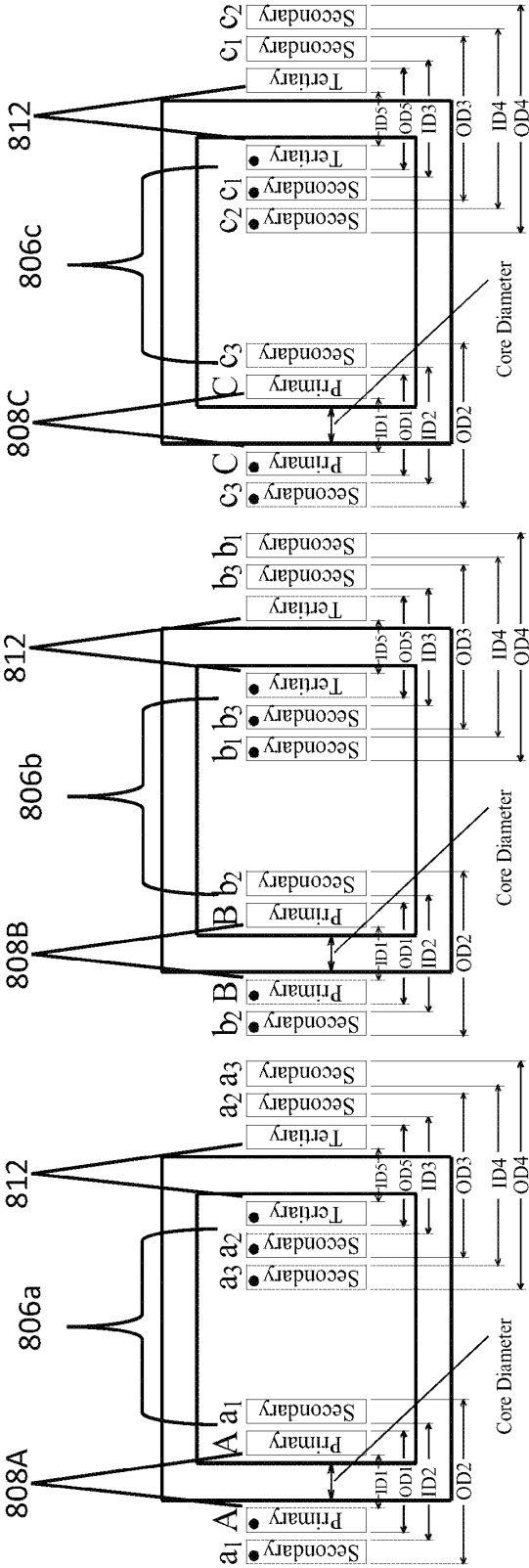


FIG. 8M

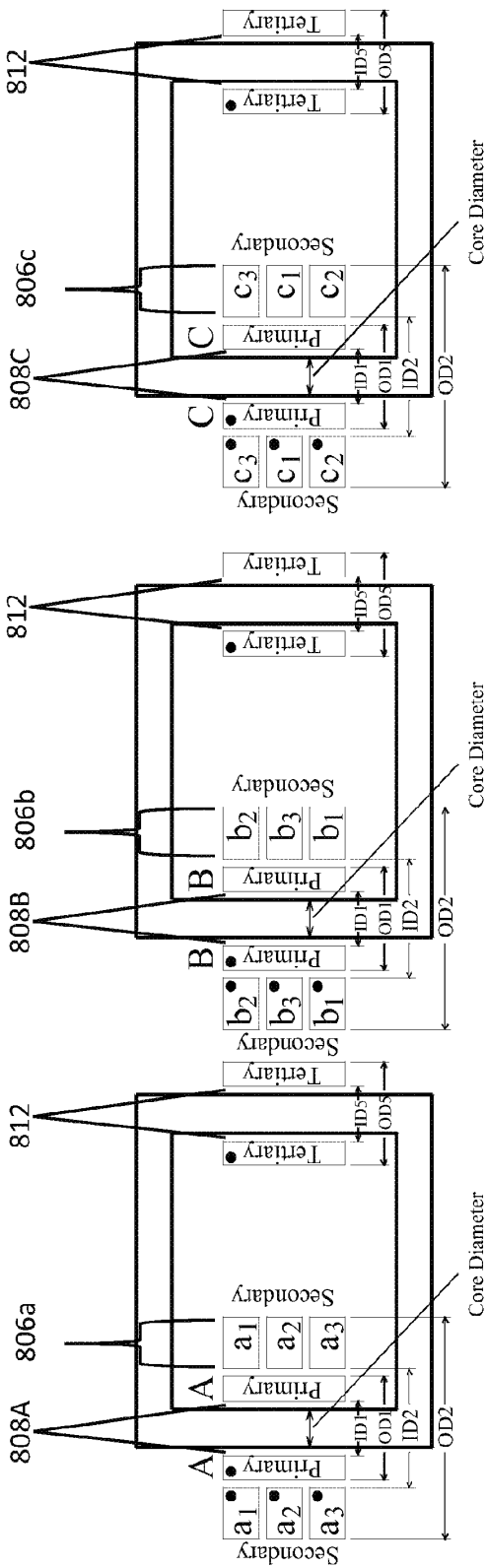


FIG. 8N

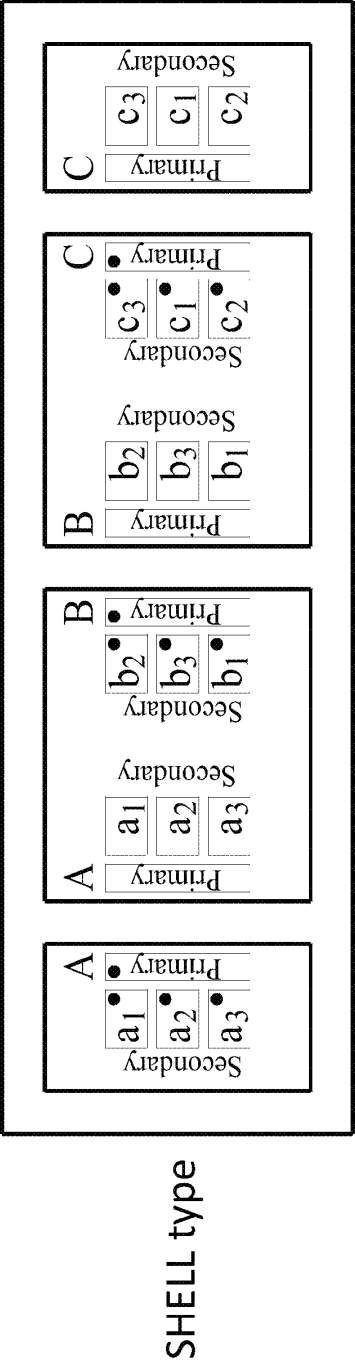
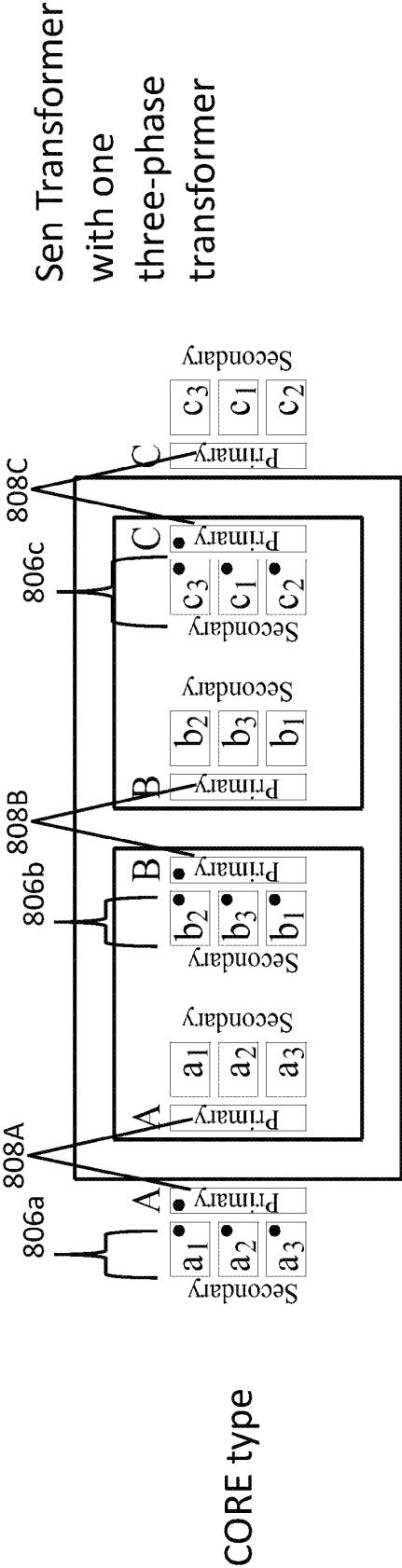


FIG. 80

Sen Transformer
with three
single-phase
transformers

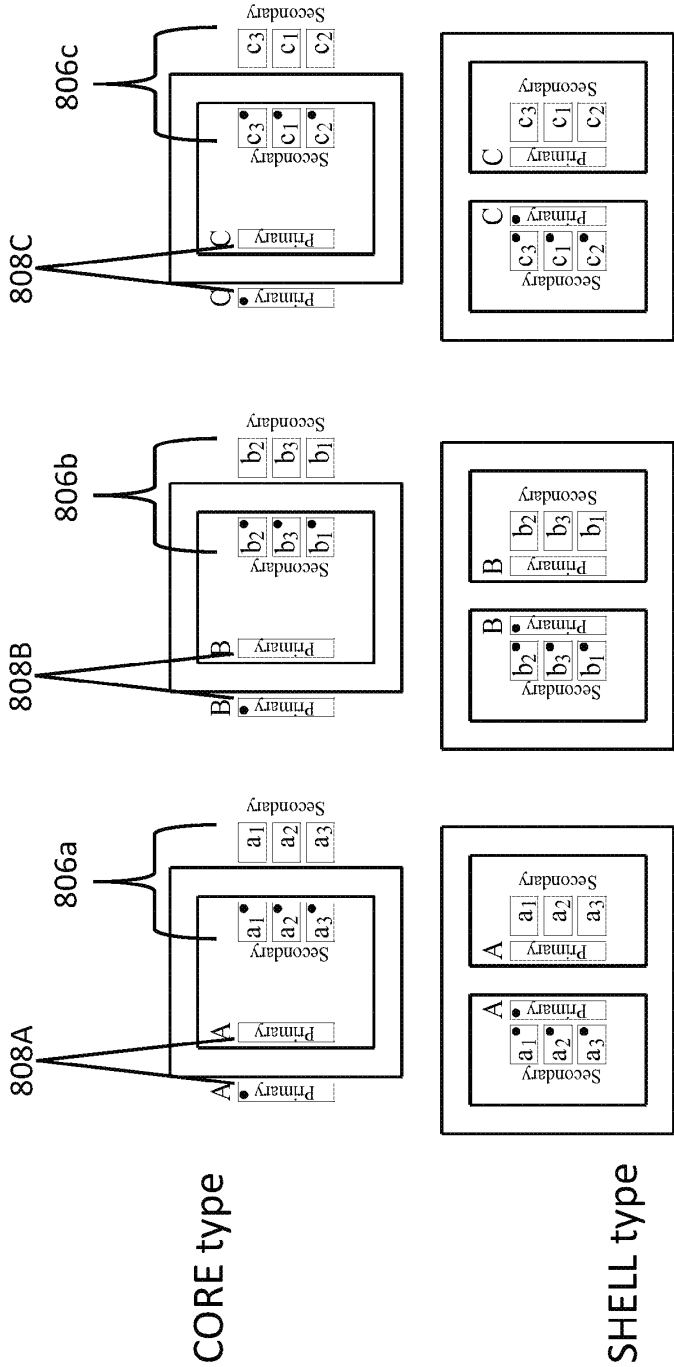


FIG. 8P

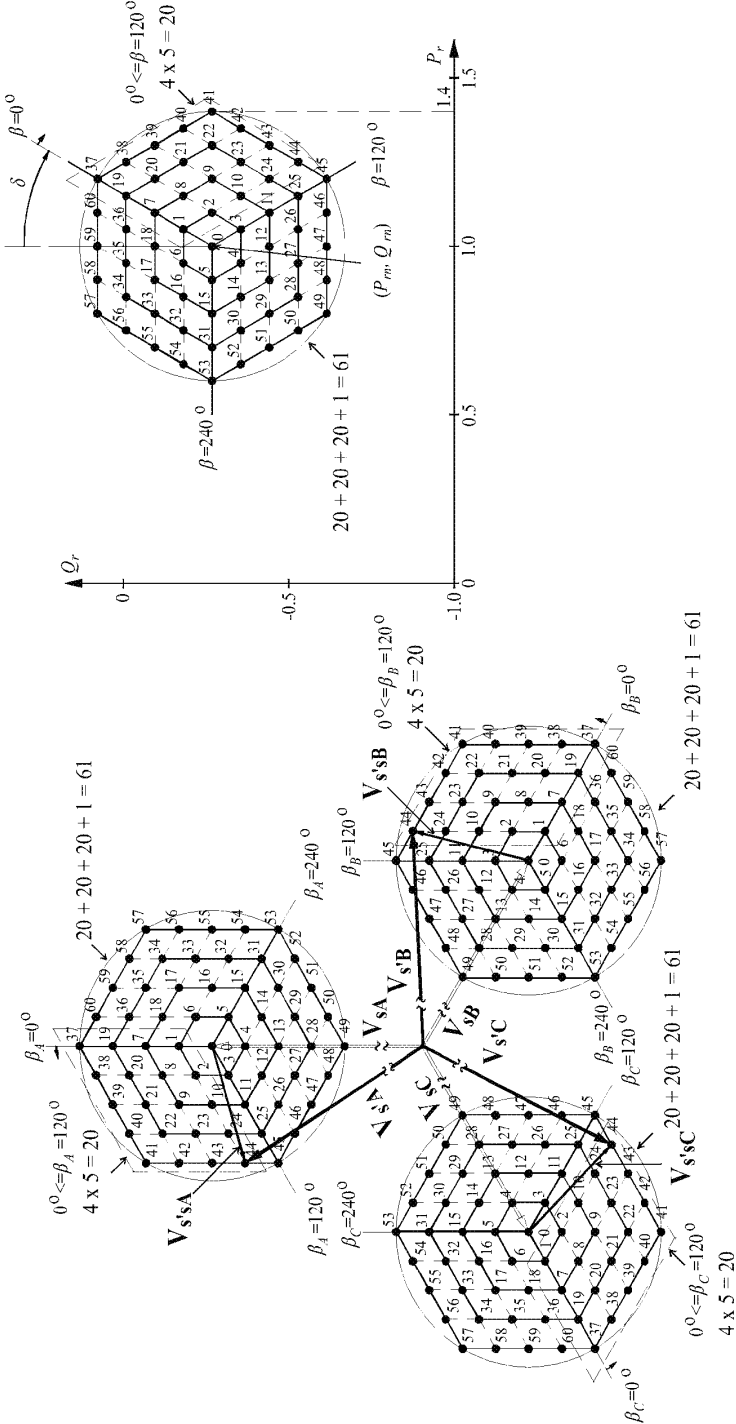


FIG. 9B

FIG. 9A

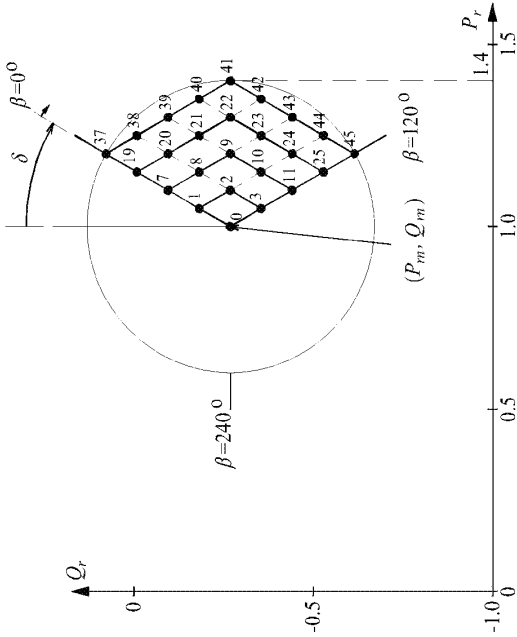


FIG. 9D

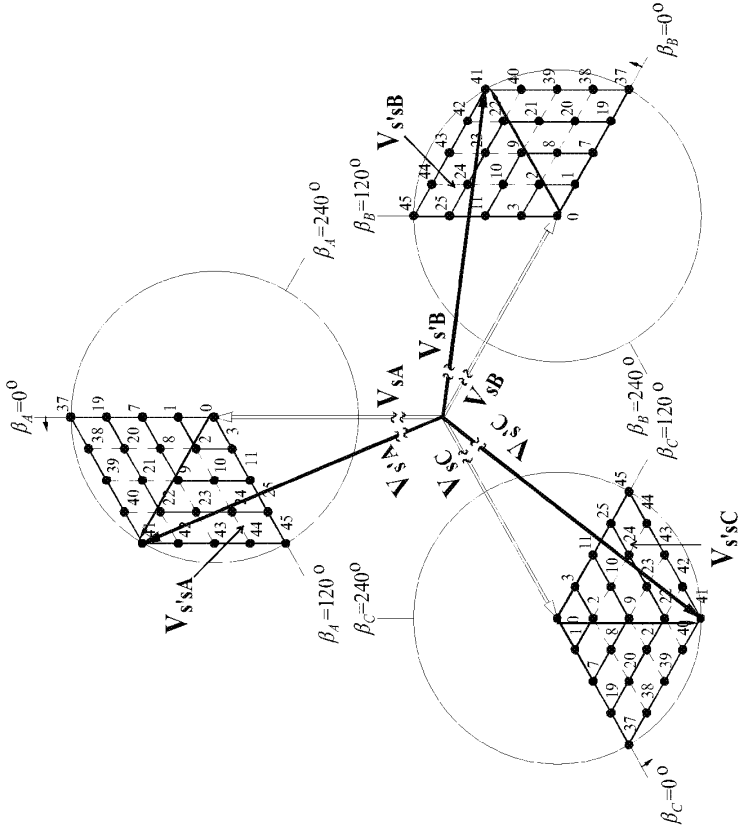


FIG. 9C

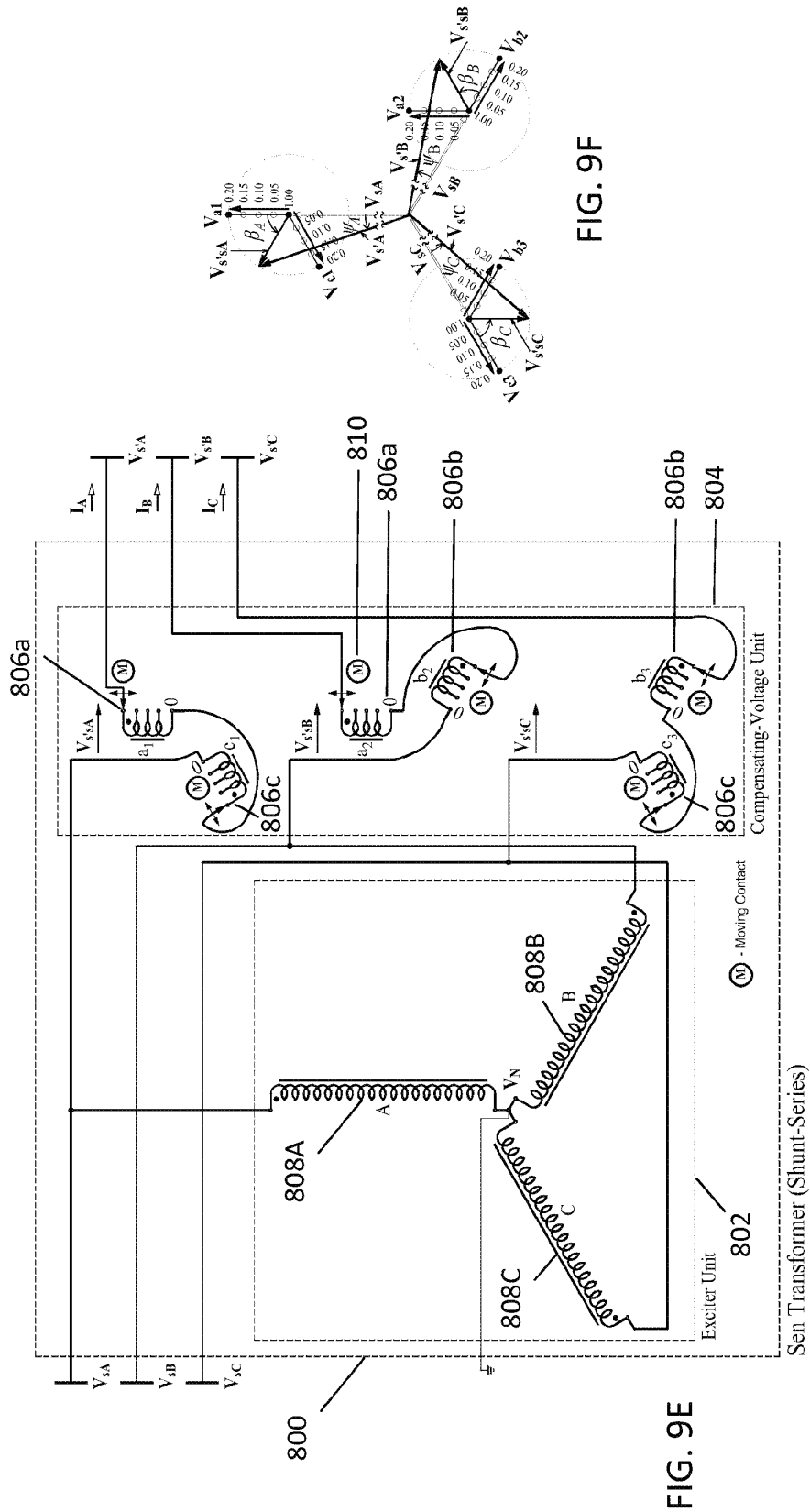
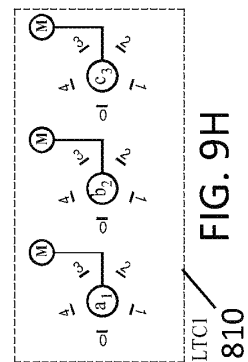
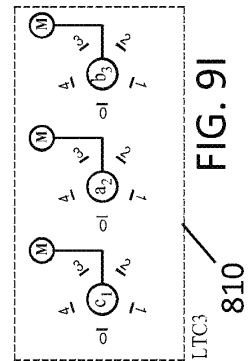
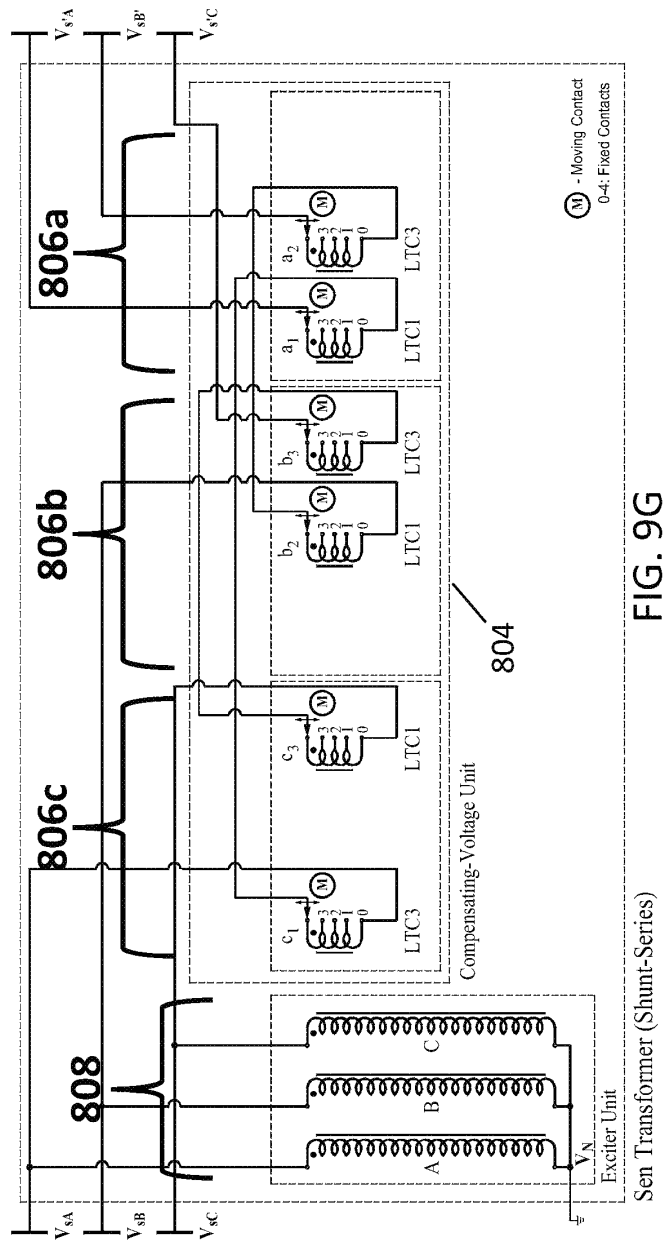


FIG. 9E

FIG. 9F



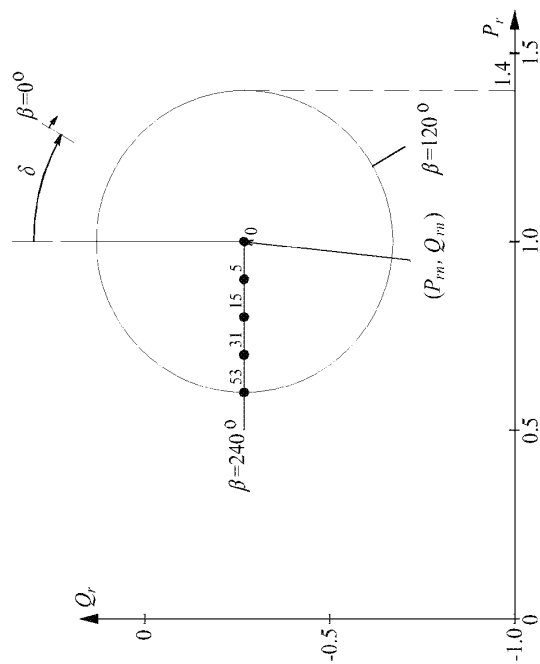


FIG. 9K

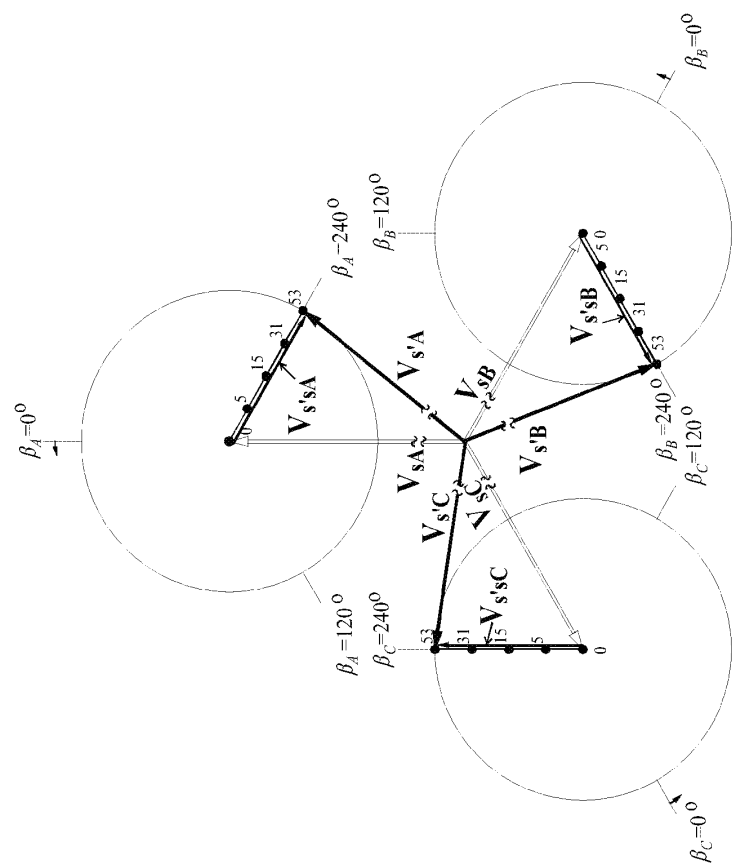
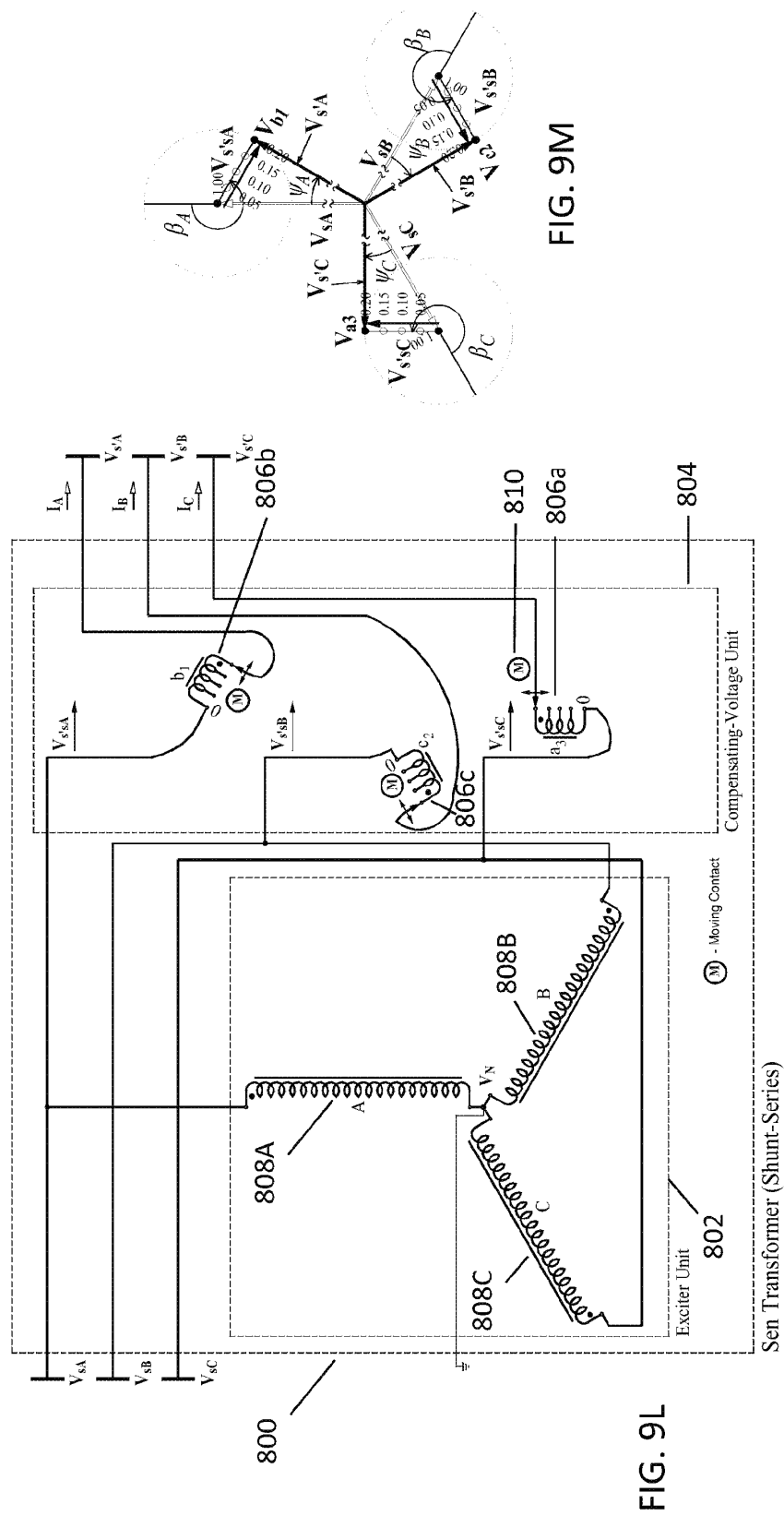


FIG. 9J



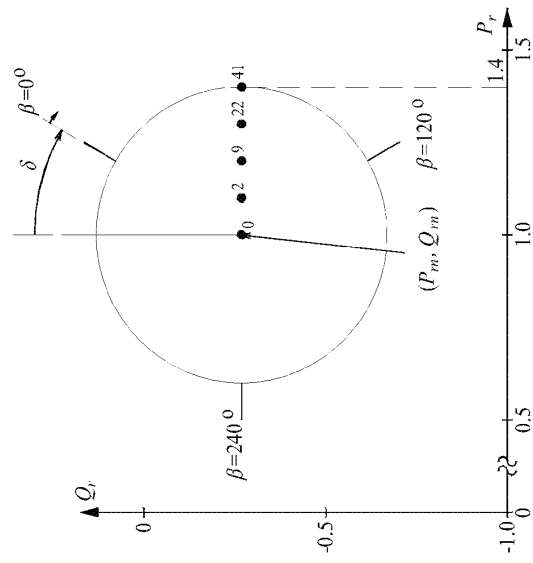


FIG. 9Q

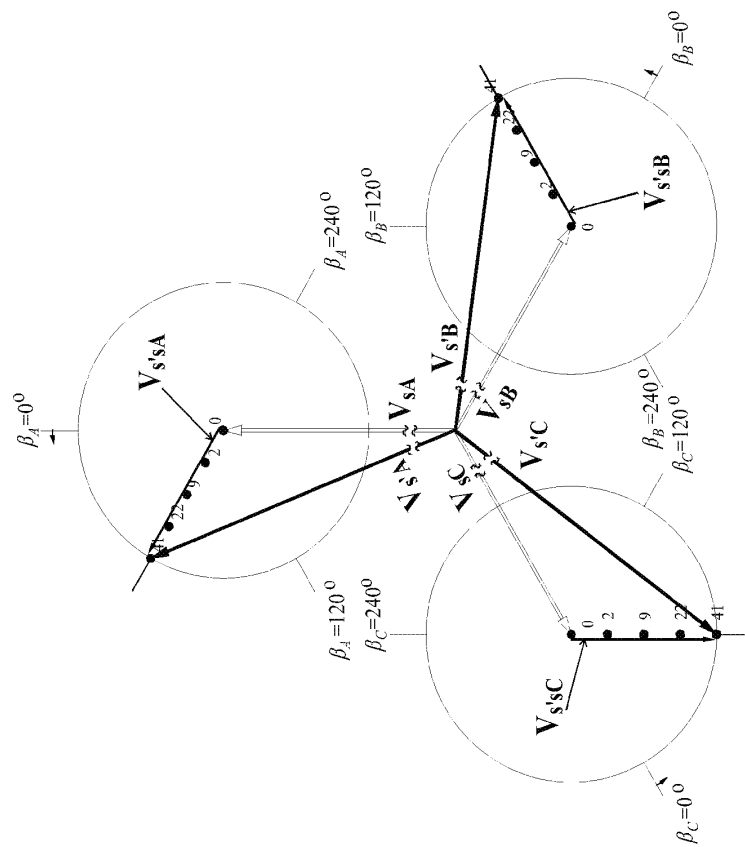
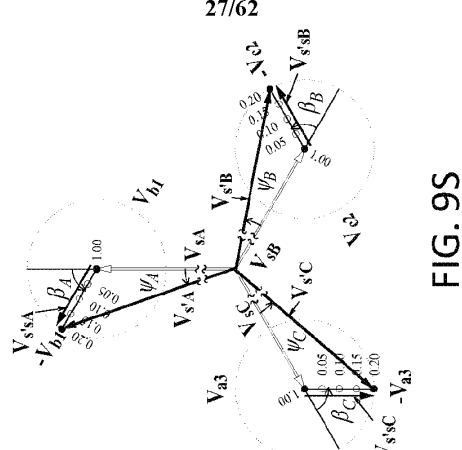
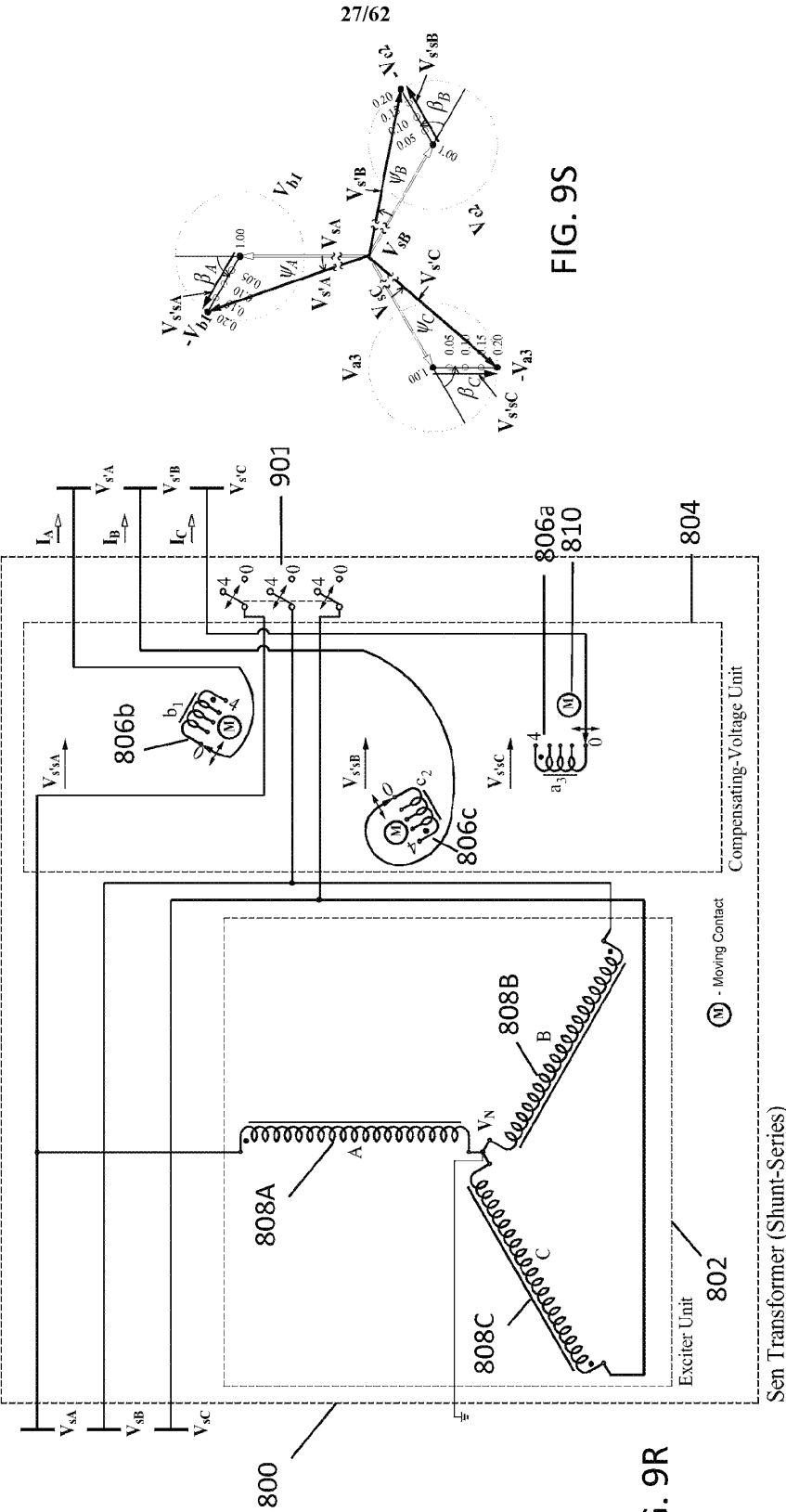
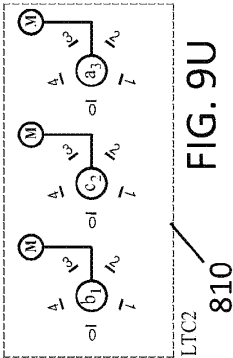
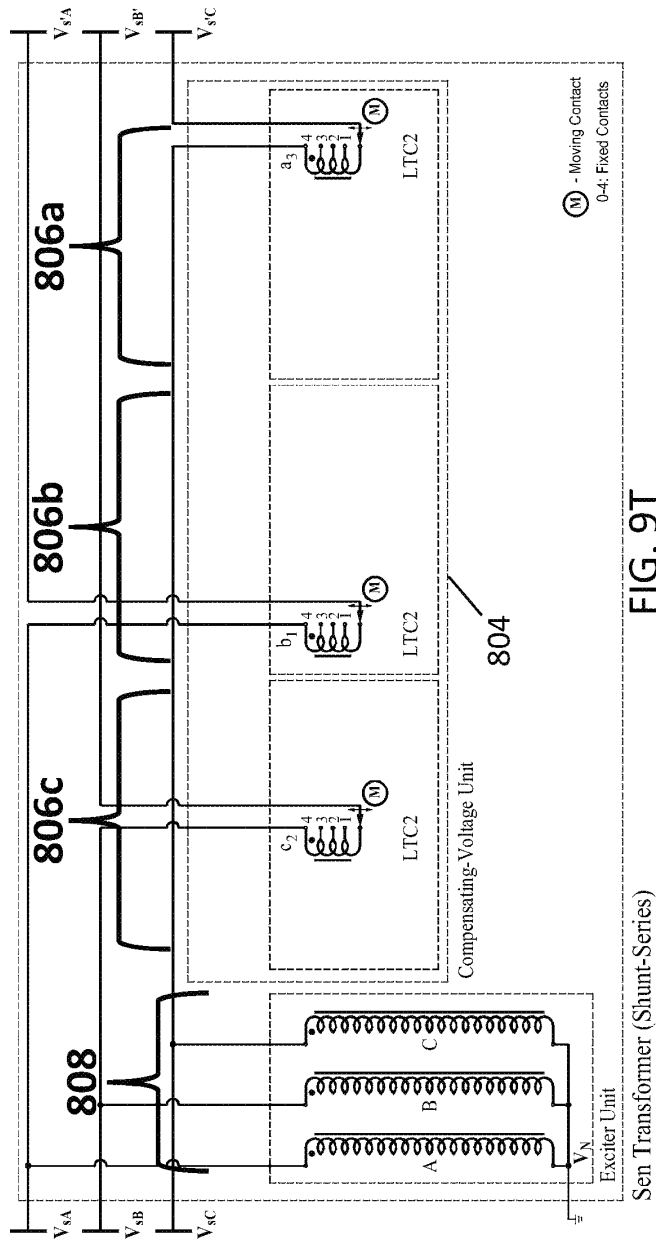


FIG. 9P





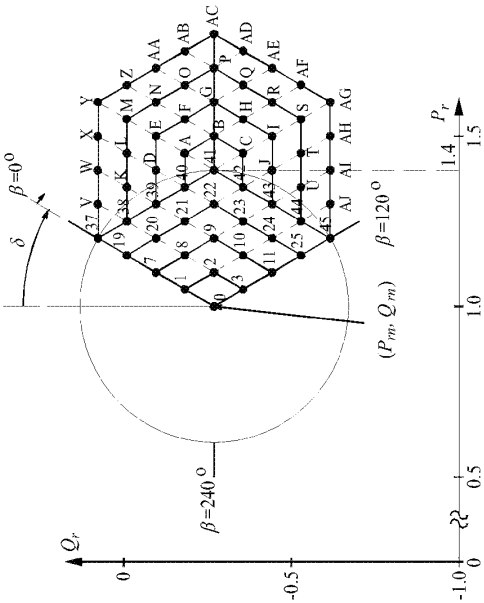


FIG. 9W

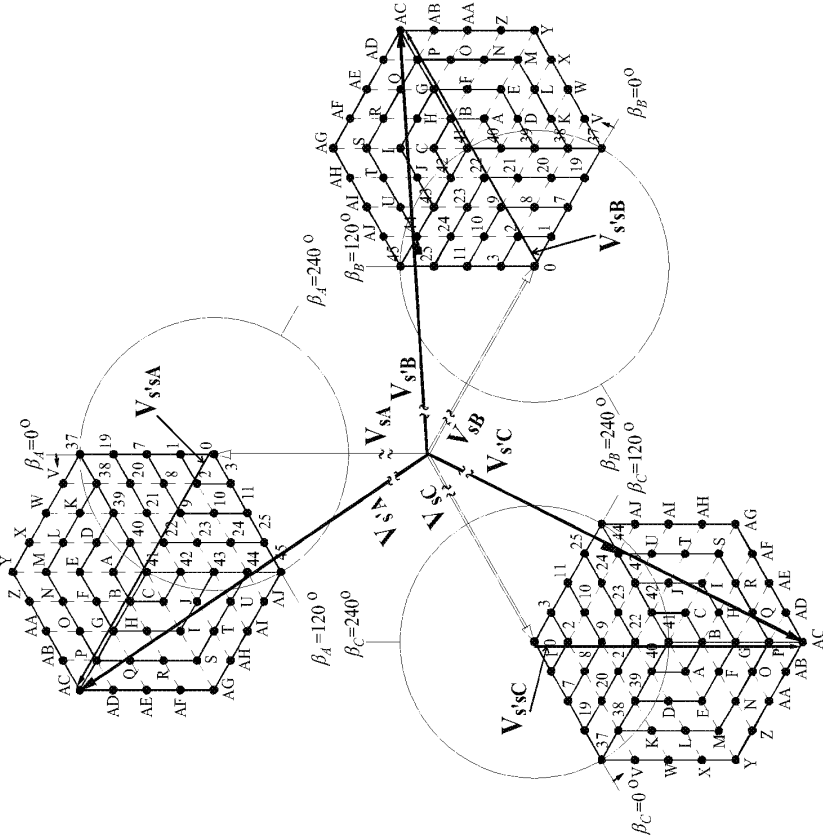


FIG. 9V

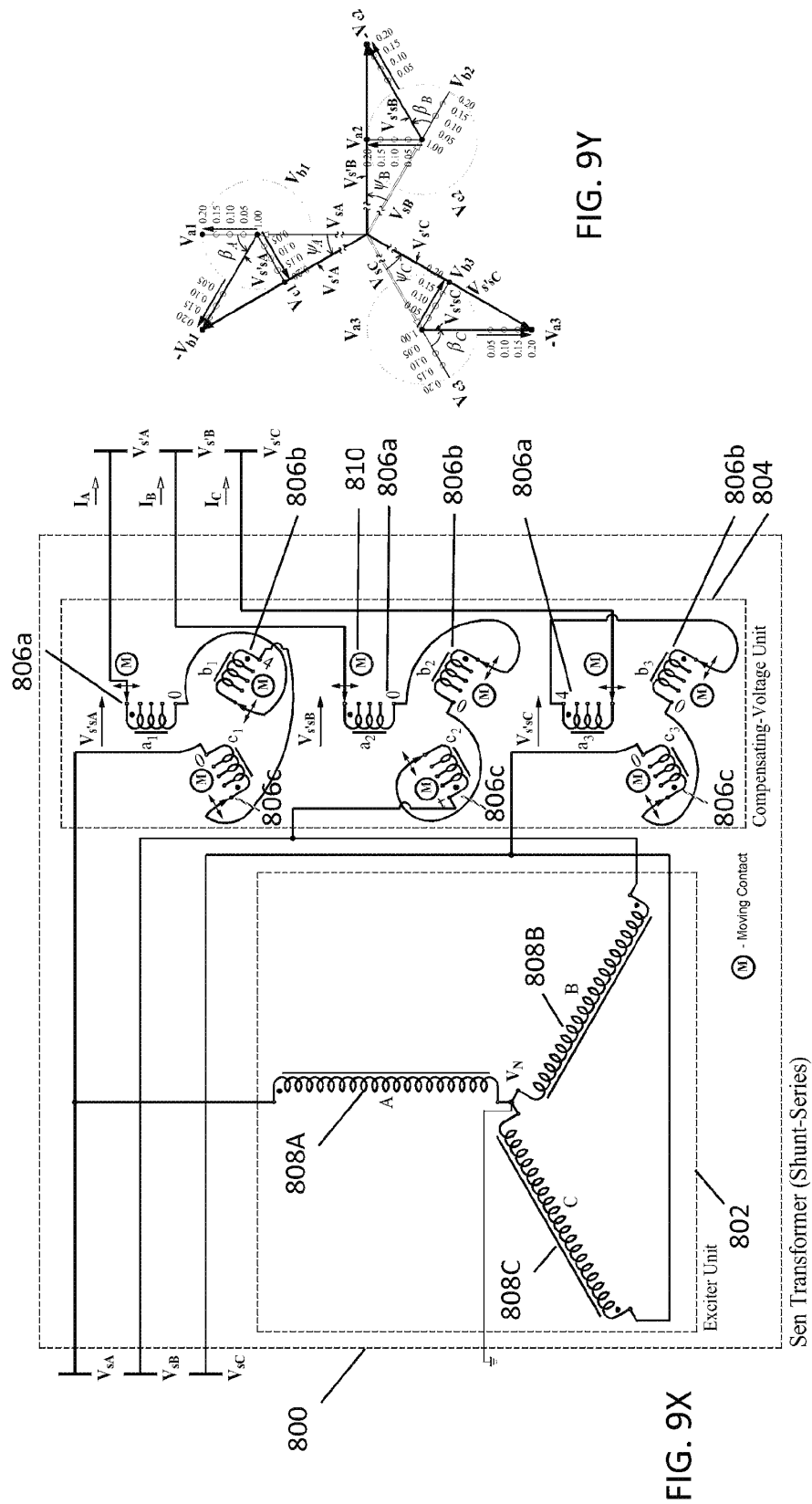
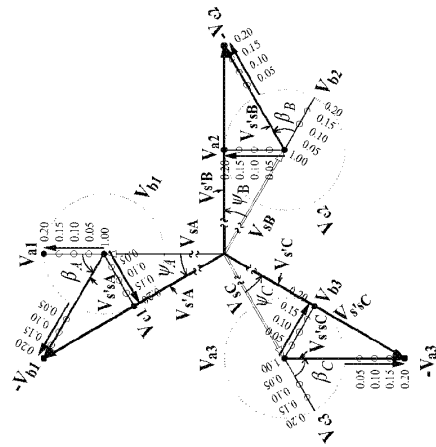


FIG. 9Y



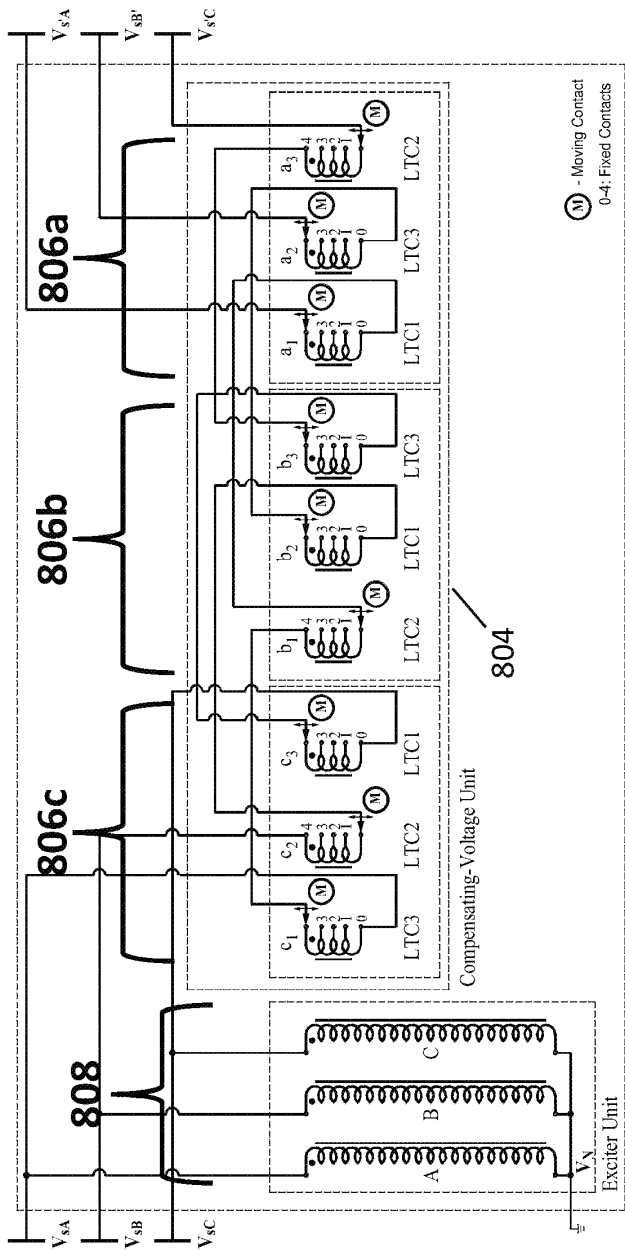


FIG. 9Z

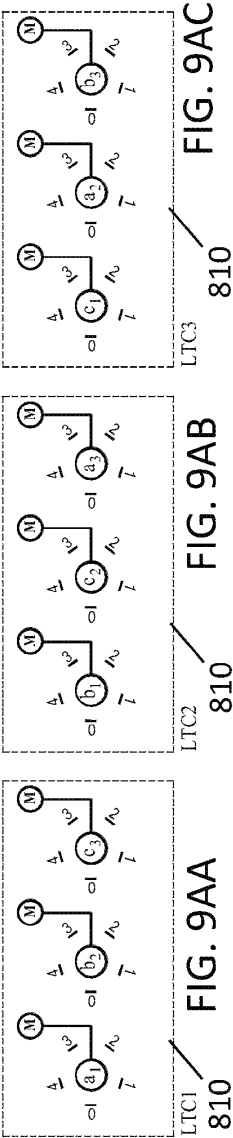


FIG. 9AA

FIG. 9AB

FIG. 9AC

Operating points	Turns-ratios			$V_{s's}$ (pu)	β (degree)	V_s^* (pu)	ψ (degree)	P_r (pu)	Q_r (pu)	S_r (pu)	P_{se} (pu)	Q_{se} (pu)	S_{se} (pu)	I (pu)
	$k_{a1},$ $k_{b2},$ k_{c3}	$k_{b1},$ $k_{c2},$ k_{a3}	$k_{c1},$ $k_{a2},$ k_{b3}											
0	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00000	-0.2679	1.0353	0.00000	0.00000	0.0000	1.0353

FIG. 10A

Operating points	Voltage-ratios			$V_{s's}$ (pu)	β (degree)	V_s (pu)	ψ (degree)	P_r (pu)	Q_r (pu)	S_r (pu)	P_{se} (pu)	Q_{se} (pu)	S_{se} (pu)	I (pu)
	$k_{a1},$ $k_{b2},$ k_{c3}	$k_{b1},$ $k_{c2},$ k_{a3}	$k_{c1},$ $k_{a2},$ k_{b3}											
1	0.05	0.00	0.00	0.05	0.00	1.05	0.00	1.0500	-0.1813	1.0655	-0.0500	-0.0184	0.0533	1.0655
2	0.05	0.00	0.05	0.05	60.00	1.03	2.42	1.1000	-0.2679	1.1322	-0.0134	-0.0550	0.0566	1.1322
3	0.00	0.00	0.05	0.05	120.00	0.98	2.54	1.0500	-0.3546	1.1082	0.0366	-0.0416	0.0554	1.1082
4	0.00	0.05	0.05	0.05	180.00	0.95	0.00	0.9500	-0.3546	1.0140	0.0500	0.0084	0.0507	1.0140
5	0.00	0.05	0.00	0.05	240.00	0.98	-2.54	0.9000	-0.2679	0.9390	0.0134	0.0450	0.0470	0.9390
6	0.05	0.05	0.00	0.05	300.00	1.03	-2.42	0.9500	-0.1813	0.9672	-0.0366	0.0316	0.0484	0.9672

FIG. 10B

Operating points	Voltage-ratios			$V_{s's}$ (pu)	β (degree)	V_s (pu)	ψ (degree)	P_r (pu)	Q_r (pu)	S_r (pu)	P_{se} (pu)	Q_{se} (pu)	S_{se} (pu)	I (pu)
	$k_{a1},$ $k_{b2},$ k_{c3}	$k_{b1},$ $k_{c2},$ k_{a3}	$k_{c1},$ $k_{a2},$ k_{b3}											
7	0.10	0.00	0.00	0.10	0.00	1.10	0.00	1.1000	-0.0947	1.1041	-0.1000	-0.0468	0.1104	1.1041
8	0.10	0.00	0.05	0.09	30.00	1.08	2.31	1.1500	-0.1813	1.1642	-0.0634	-0.0784	0.1008	1.1642
9	0.10	0.00	0.10	0.10	60.00	1.05	4.72	1.2000	-0.2679	1.2296	-0.0268	-0.1200	0.1230	1.2296
10	0.05	0.00	0.10	0.09	90.00	1.00	4.95	1.1500	-0.3546	1.2034	0.0232	-0.1016	0.1042	1.2034
11	0.00	0.00	0.10	0.10	120.00	0.95	5.21	1.1000	-0.4412	1.1852	0.0732	-0.0932	0.1185	1.1852
12	0.00	0.05	0.10	0.09	150.00	0.93	2.68	1.0000	-0.4412	1.0930	0.0866	-0.0382	0.0947	1.0930
13	0.00	0.10	0.10	0.10	180.00	0.90	0.00	0.9000	-0.4412	1.0023	0.1000	0.0068	0.1002	1.0023
14	0.00	0.10	0.05	0.09	210.00	0.93	-2.68	0.8500	-0.3546	0.9210	0.0634	0.0484	0.0798	0.9210
15	0.00	0.10	0.00	0.10	240.00	0.95	-5.21	0.8000	-0.2679	0.8437	0.0268	0.0800	0.0844	0.8437
16	0.05	0.10	0.00	0.09	270.00	1.00	-4.95	0.8500	-0.1813	0.8691	-0.0232	0.0716	0.0753	0.8691
17	0.10	0.10	0.00	0.10	300.00	1.05	-4.72	0.9000	-0.0947	0.9050	-0.0732	0.0532	0.0905	0.9050
18	0.10	0.05	0.00	0.09	330.00	1.08	-2.31	1.0000	-0.0947	1.0045	-0.0866	0.0082	0.0870	1.0045

FIG. 10C

Operating points	Voltage-ratios			$V_{s's}$ (pu)	β (degree)	$V_{s'}$ (pu)	ψ (degree)	P_r (pu)	Q_r (pu)	S_r (pu)	P_{se} (pu)	Q_{se} (pu)	S_{se} (pu)	I (pu)
	k_{a1}, k_{b2}, k_{c3}	k_{b1}, k_{c2}, k_{a3}	k_{c1}, k_{a2}, k_{b3}											
19	0.15	0.00	0.00	0.15	0.00	1.15	0.00	1.1500	-0.0081	1.1500	-0.1500	-0.0852	0.1725	1.1500
20	0.15	0.00	0.05	0.13	19.11	1.13	2.20	1.2000	-0.0947	1.2037	-0.1134	-0.1118	0.1592	1.2037
21	0.15	0.00	0.10	0.13	40.89	1.10	4.50	1.2500	-0.1813	1.2631	-0.0768	-0.1484	0.1671	1.2631
22	0.15	0.00	0.15	0.15	60.00	1.08	6.89	1.3000	-0.2679	1.3273	-0.0402	-0.1950	0.1991	1.3273
23	0.10	0.00	0.15	0.13	79.11	1.03	7.22	1.2500	-0.3546	1.2993	0.0098	-0.1716	0.1719	1.2993
24	0.05	0.00	0.15	0.13	100.89	0.98	7.59	1.2000	-0.4412	1.2785	0.0598	-0.1582	0.1691	1.2785
25	0.00	0.00	0.15	0.15	120.00	0.93	7.99	1.1500	-0.5278	1.2653	0.1098	-0.1548	0.1898	1.2653
26	0.00	0.05	0.15	0.13	139.11	0.90	5.50	1.0500	-0.5278	1.1752	0.1232	-0.0948	0.1555	1.1752
27	0.00	0.10	0.15	0.13	160.89	0.88	2.83	0.9500	-0.5278	1.0868	0.1366	-0.0448	0.1438	1.0868
28	0.00	0.15	0.15	0.15	180.00	0.85	0.00	0.8500	-0.5278	1.0005	0.1500	-0.0048	0.1501	1.0005
29	0.00	0.15	0.10	0.13	199.11	0.88	-2.83	0.8000	-0.4412	0.9136	0.1134	0.0418	0.1209	0.9136
30	0.00	0.15	0.05	0.13	220.89	0.90	-5.50	0.7500	-0.3546	0.8296	0.0768	0.0784	0.1097	0.8296
31	0.00	0.15	0.00	0.15	240.00	0.93	-7.99	0.7000	-0.2679	0.7495	0.0402	0.1050	0.1124	0.7495
32	0.05	0.15	0.00	0.13	259.11	0.98	-7.59	0.7500	-0.1813	0.7716	-0.0098	0.1016	0.1021	0.7716
33	0.10	0.15	0.00	0.13	280.89	1.03	-7.22	0.8000	-0.0947	0.8056	-0.0598	0.0882	0.1066	0.8056
34	0.15	0.15	0.00	0.15	300.00	1.08	-6.89	0.8500	-0.0081	0.8500	-0.1098	0.0648	0.1275	0.8500
35	0.15	0.10	0.00	0.13	319.11	1.10	-4.50	0.9500	-0.0081	0.9500	-0.1232	0.0248	0.1257	0.9500
36	0.15	0.05	0.00	0.13	340.89	1.13	-2.20	1.0500	-0.0081	1.0500	-0.1366	-0.0252	0.1389	1.0500

FIG. 10D

Operating points	Voltage-ratios			V_{s3} (pu)	β (degree)	$V_{s'}$ (pu)	ψ (degree)	P_r (pu)	Q_r (pu)	S_r (pu)	P_{se} (pu)	Q_{se} (pu)	S_{se} (pu)	I (pu)
	$k_{a1},$	$k_{b1},$	k_{c1}											
	$k_{b2},$	$k_{c2},$	k_{a3}											
	k_{c3}	$k_{a2},$	k_{b3}											
37	0.20	0.00	0.00	0.20	0.00	1.20	0.00	1.2000	0.0785	1.2026	-0.2000	-0.1336	0.2405	1.2026
38	0.20	0.00	0.05	0.18	13.90	1.18	2.11	1.2500	-0.0081	1.2500	-0.1634	-0.1552	0.2254	1.2500
39	0.20	0.00	0.10	0.17	30.00	1.15	4.31	1.3000	-0.0947	1.3034	-0.1268	-0.1868	0.2258	1.3034
40	0.20	0.00	0.15	0.18	46.10	1.13	6.59	1.3500	-0.1813	1.3621	-0.0902	-0.2284	0.2456	1.3621
41	0.20	0.00	0.20	0.20	60.00	1.11	8.95	1.4000	-0.2679	1.4254	-0.0536	-0.2800	0.2851	1.4254
42	0.15	0.00	0.20	0.18	73.90	1.06	9.37	1.3500	-0.3546	1.3958	-0.0036	-0.2516	0.2516	1.3958
43	0.10	0.00	0.20	0.17	90.00	1.01	9.83	1.3000	-0.4412	1.3728	0.0464	-0.2332	0.2378	1.3728
44	0.05	0.00	0.20	0.18	106.10	0.97	10.33	1.2500	-0.5278	1.3568	0.0964	-0.2248	0.2446	1.3568
45	0.00	0.00	0.20	0.20	120.00	0.92	10.89	1.2000	-0.6144	1.3481	0.1464	-0.2264	0.2696	1.3481
46	0.00	0.05	0.20	0.18	133.90	0.88	8.44	1.1000	-0.6144	1.2599	0.1598	-0.1614	0.2271	1.2599
47	0.00	0.10	0.20	0.17	150.00	0.85	5.82	1.0000	-0.6144	1.1736	0.1732	-0.1064	0.2033	1.1736
48	0.00	0.15	0.20	0.18	166.10	0.83	3.00	0.9000	-0.6144	1.0897	0.1866	-0.0614	0.1964	1.0897
49	0.00	0.20	0.20	0.20	180.00	0.80	0.00	0.8000	-0.6144	1.0087	0.2000	-0.0264	0.2017	1.0087
50	0.00	0.20	0.15	0.18	193.90	0.83	-3.00	0.7500	-0.5278	0.9171	0.1634	0.0252	0.1653	0.9171
51	0.00	0.20	0.10	0.17	210.00	0.85	-5.82	0.7000	-0.4412	0.8274	0.1268	0.0668	0.1433	0.8274
52	0.00	0.20	0.05	0.18	226.10	0.88	-8.44	0.6500	-0.3546	0.7404	0.0902	0.0984	0.1335	0.7404
53	0.00	0.20	0.00	0.20	240.00	0.92	-10.89	0.6000	-0.2679	0.6571	0.0536	0.1200	0.1314	0.6571
54	0.05	0.20	0.00	0.18	253.90	0.97	-10.33	0.6500	-0.1813	0.6748	0.0036	0.1216	0.1217	0.6748
55	0.10	0.20	0.00	0.17	270.00	1.01	-9.83	0.7000	-0.0947	0.7064	-0.0464	0.1132	0.1223	0.7064
56	0.15	0.20	0.00	0.18	286.10	1.06	-9.37	0.7500	-0.0081	0.7500	-0.0964	0.0948	0.1352	0.7500
57	0.20	0.20	0.00	0.20	300.00	1.11	-8.95	0.8000	0.0785	0.8038	-0.1464	0.0664	0.1608	0.8038
58	0.20	0.15	0.00	0.18	313.90	1.13	-6.59	0.9000	0.0785	0.9034	-0.1598	0.0314	0.1629	0.9034
59	0.20	0.10	0.00	0.17	330.00	1.15	-4.31	1.0000	0.0785	1.0031	-0.1732	-0.0136	0.1737	1.0031
60	0.20	0.05	0.00	0.18	346.10	1.18	-2.11	1.1000	0.0785	1.1028	-0.1866	-0.0686	0.1988	1.1028

FIG. 10E

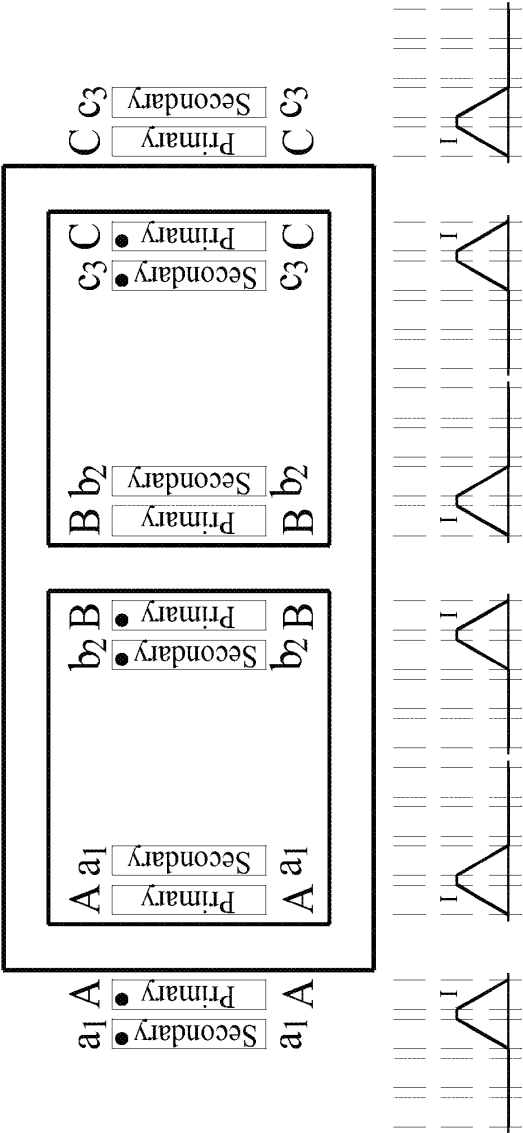


FIG. 11

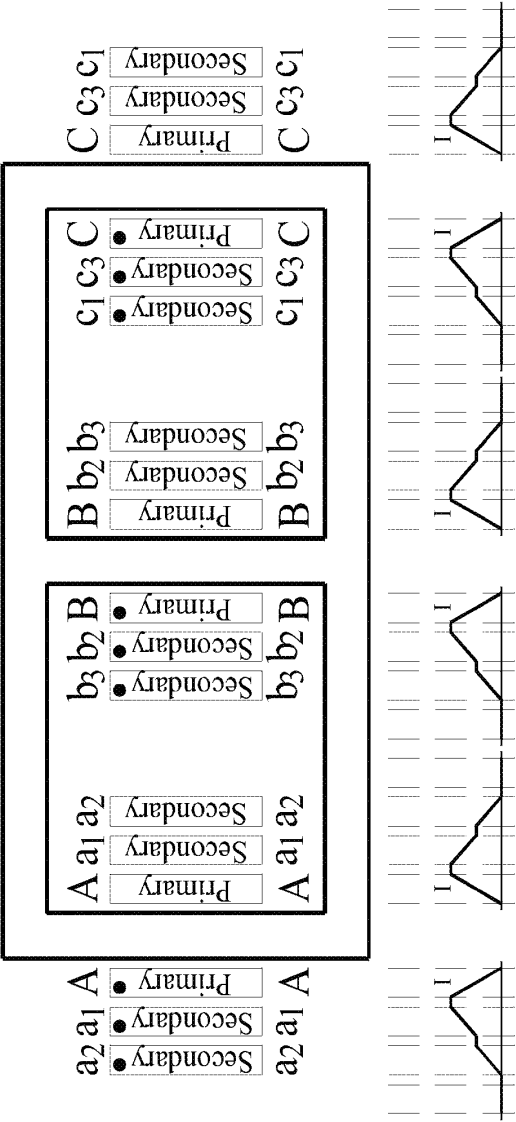


FIG. 12

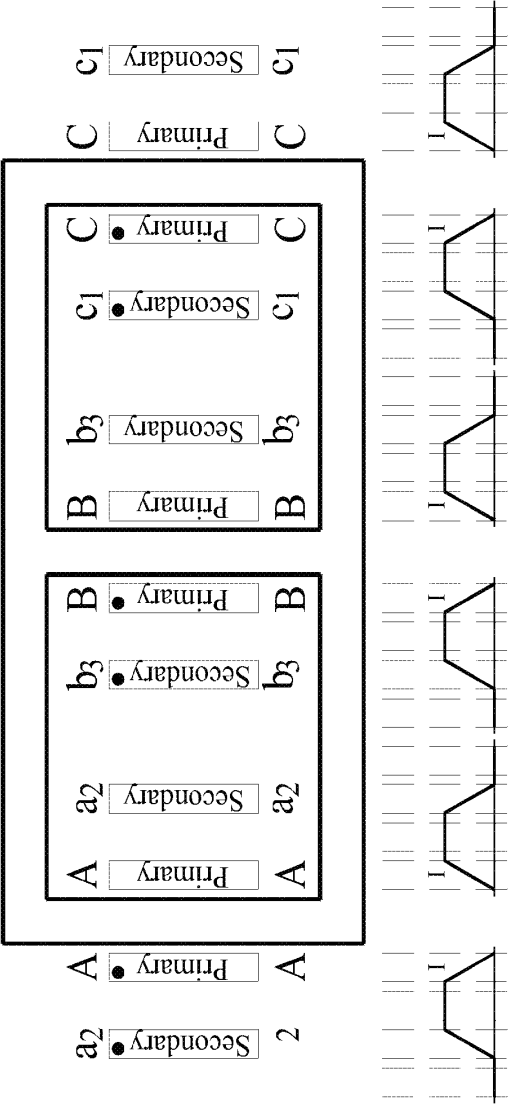


FIG. 13

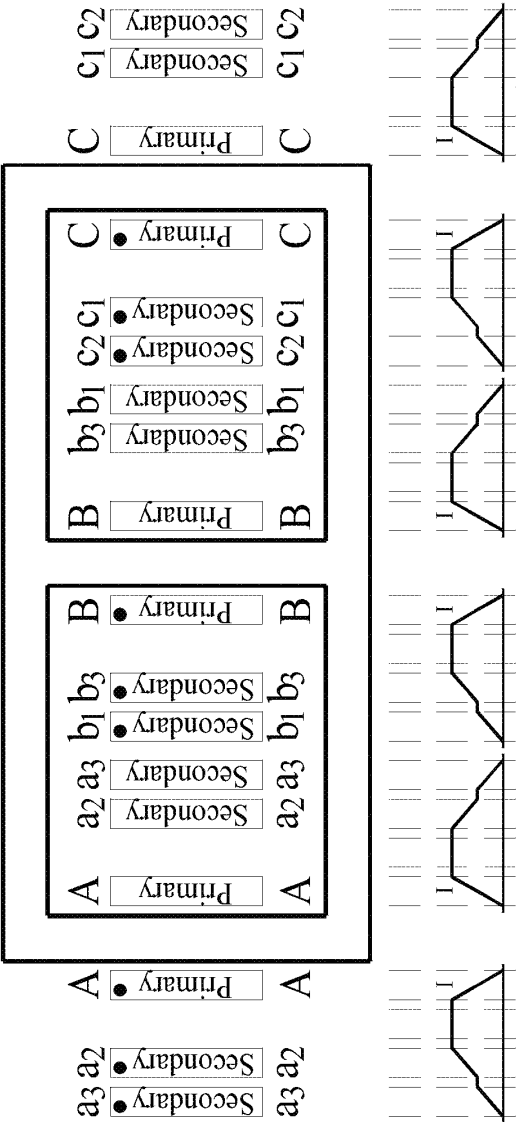
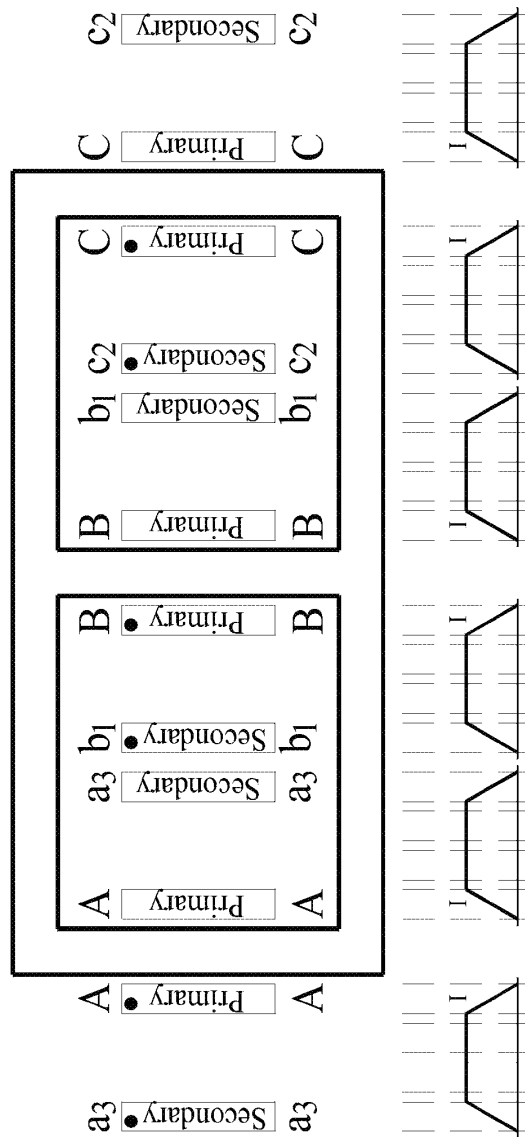


FIG. 14



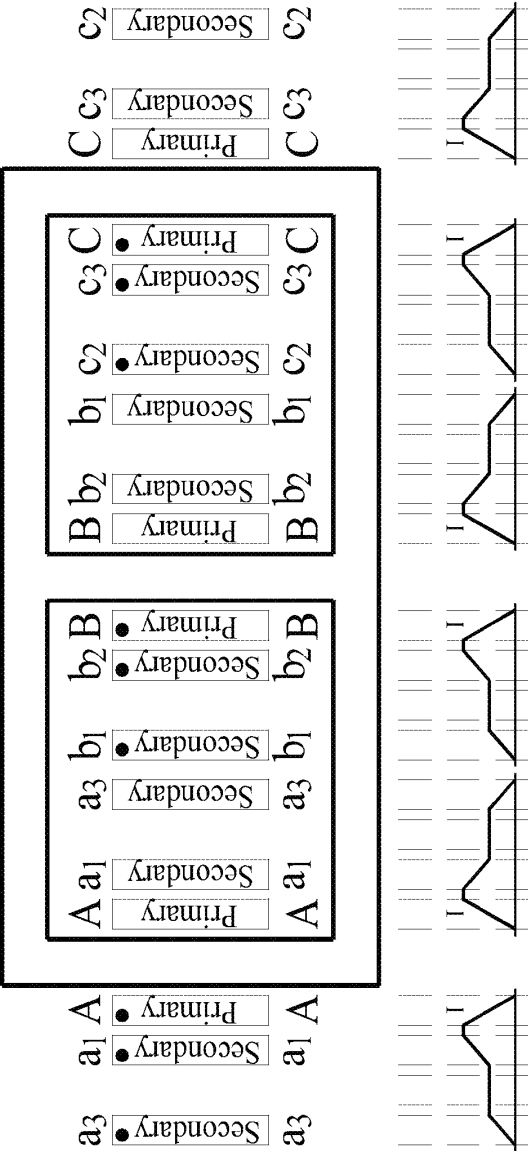


FIG. 16

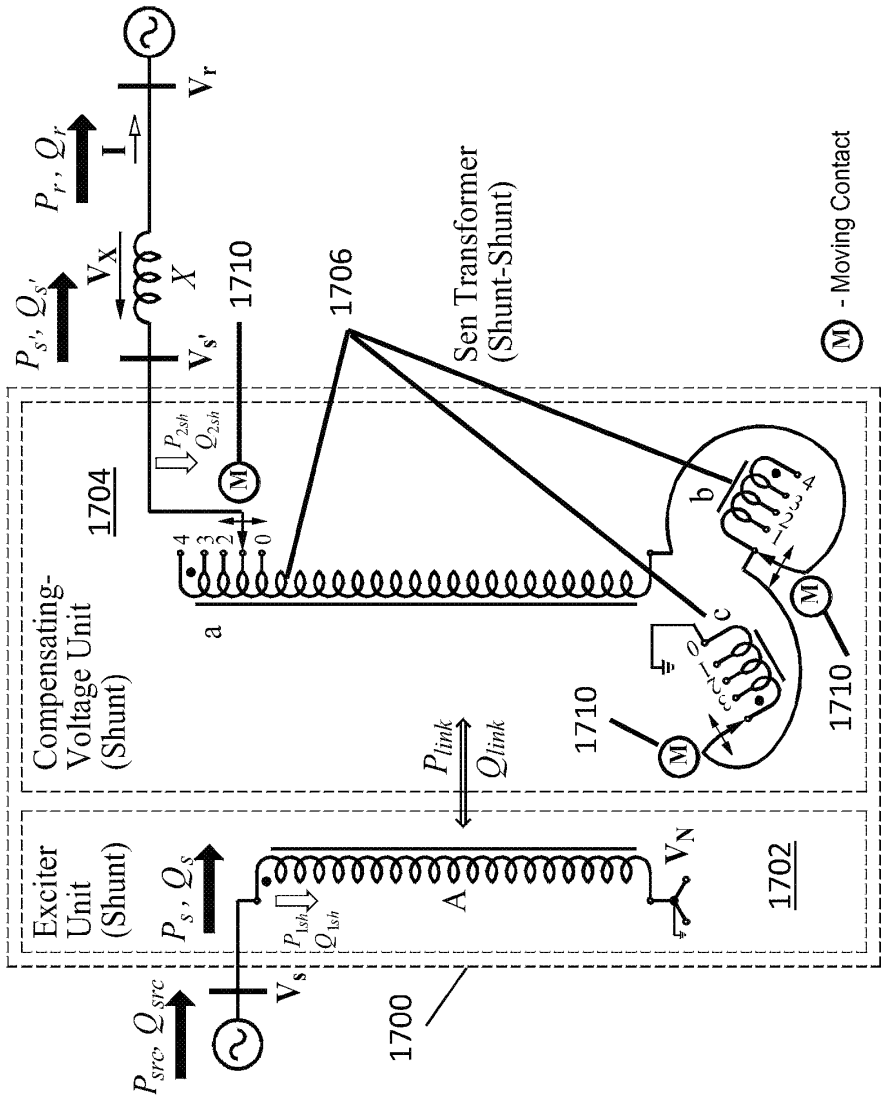


FIG. 17A

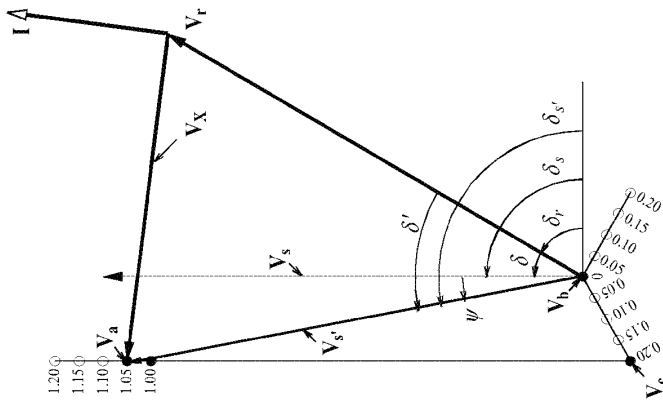


FIG. 17B

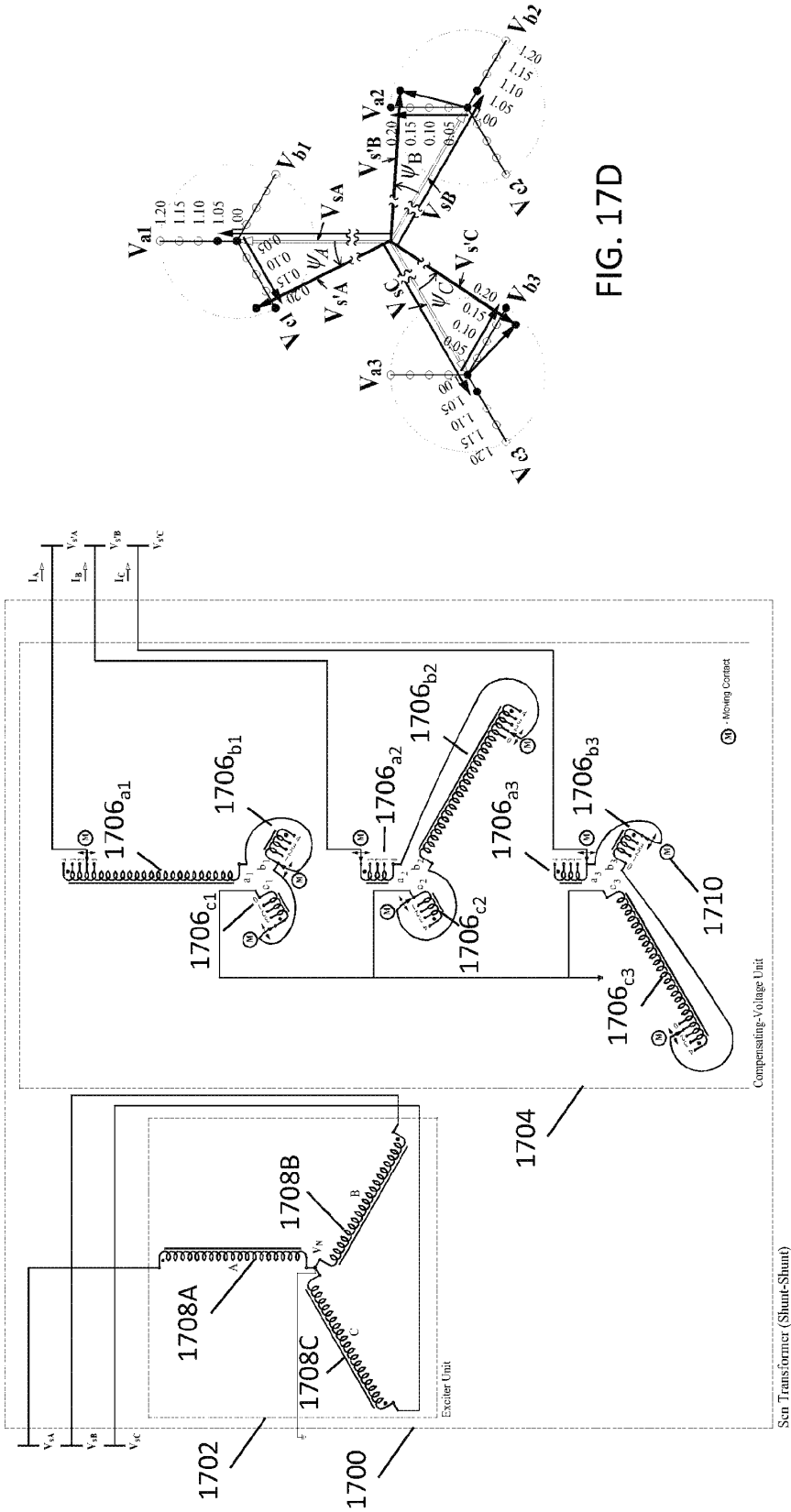


FIG. 17C

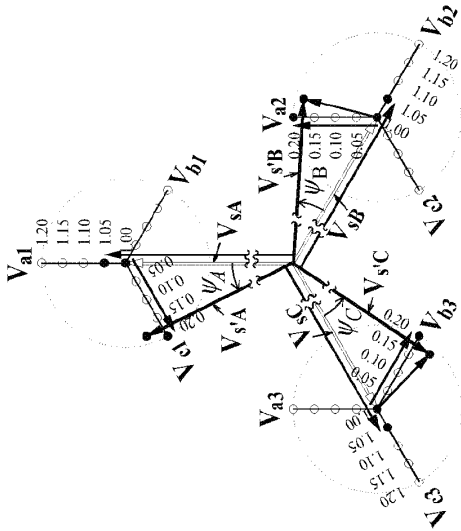
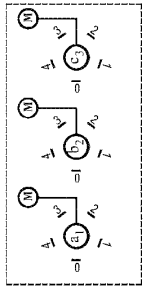
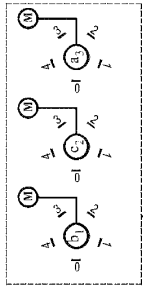
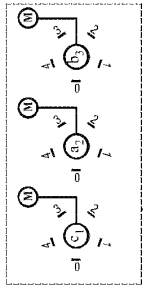
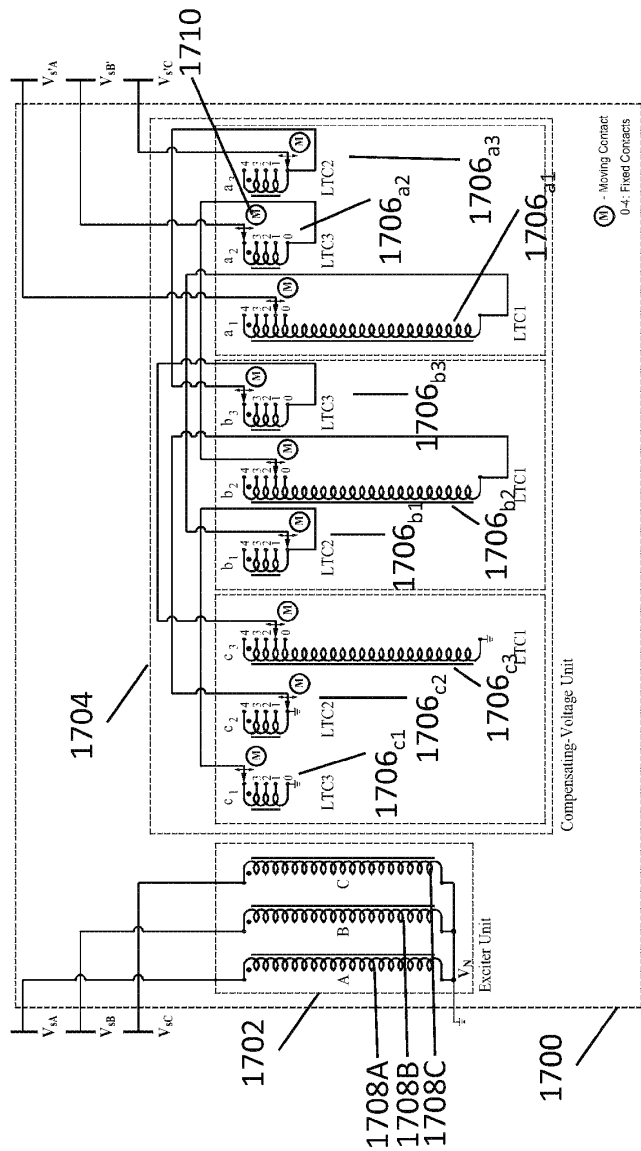


FIG. 17D



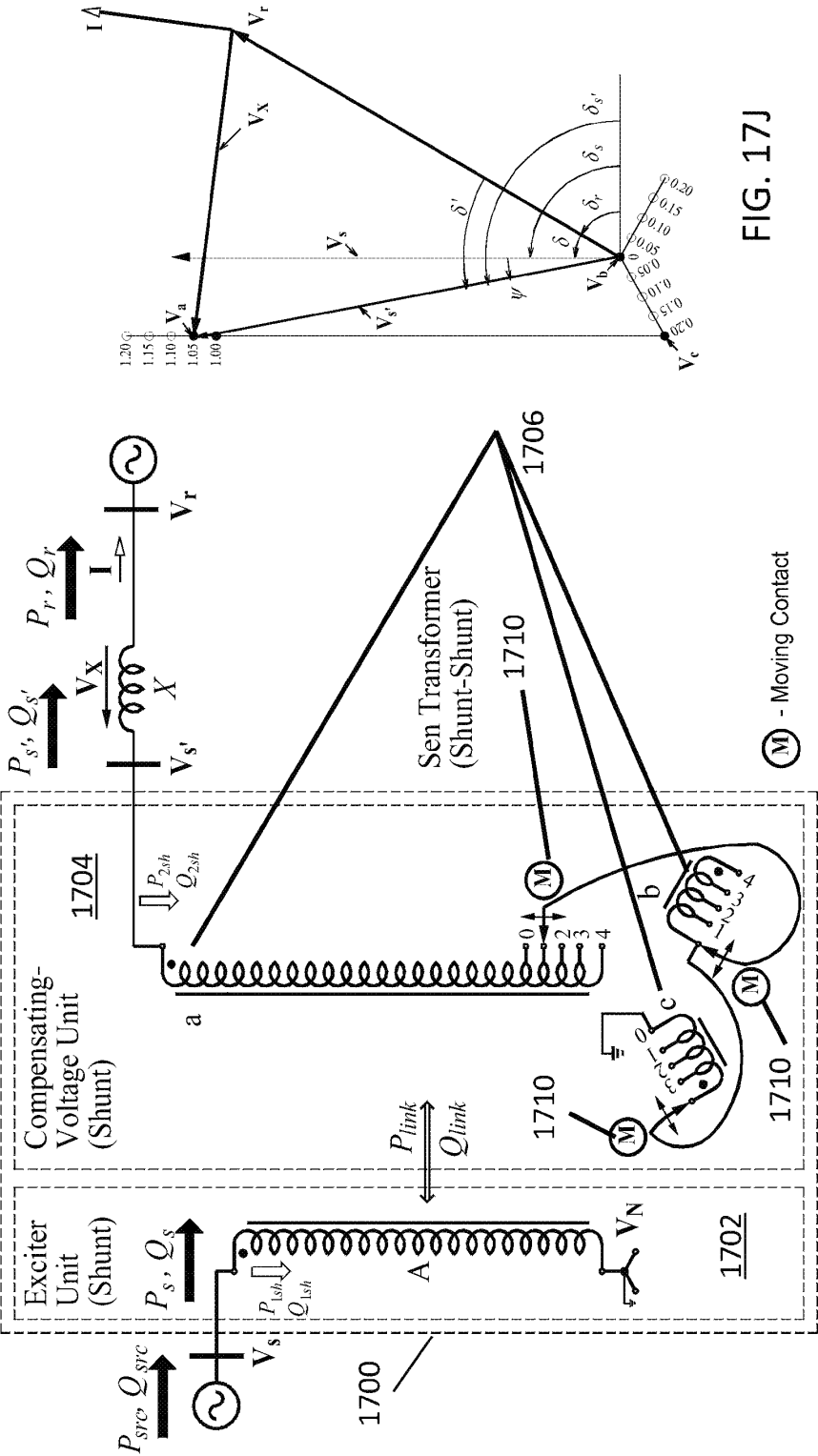


FIG. 17I

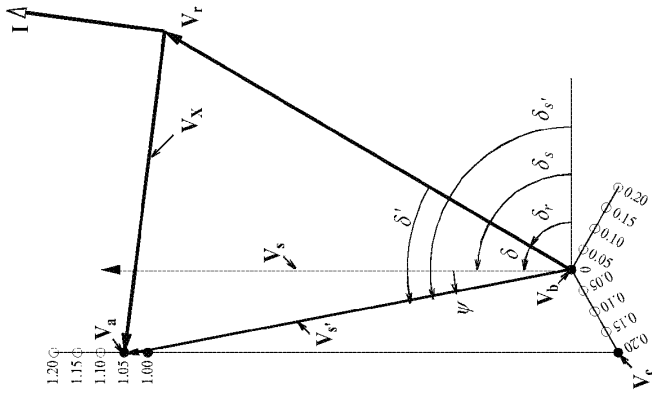


FIG. 17J

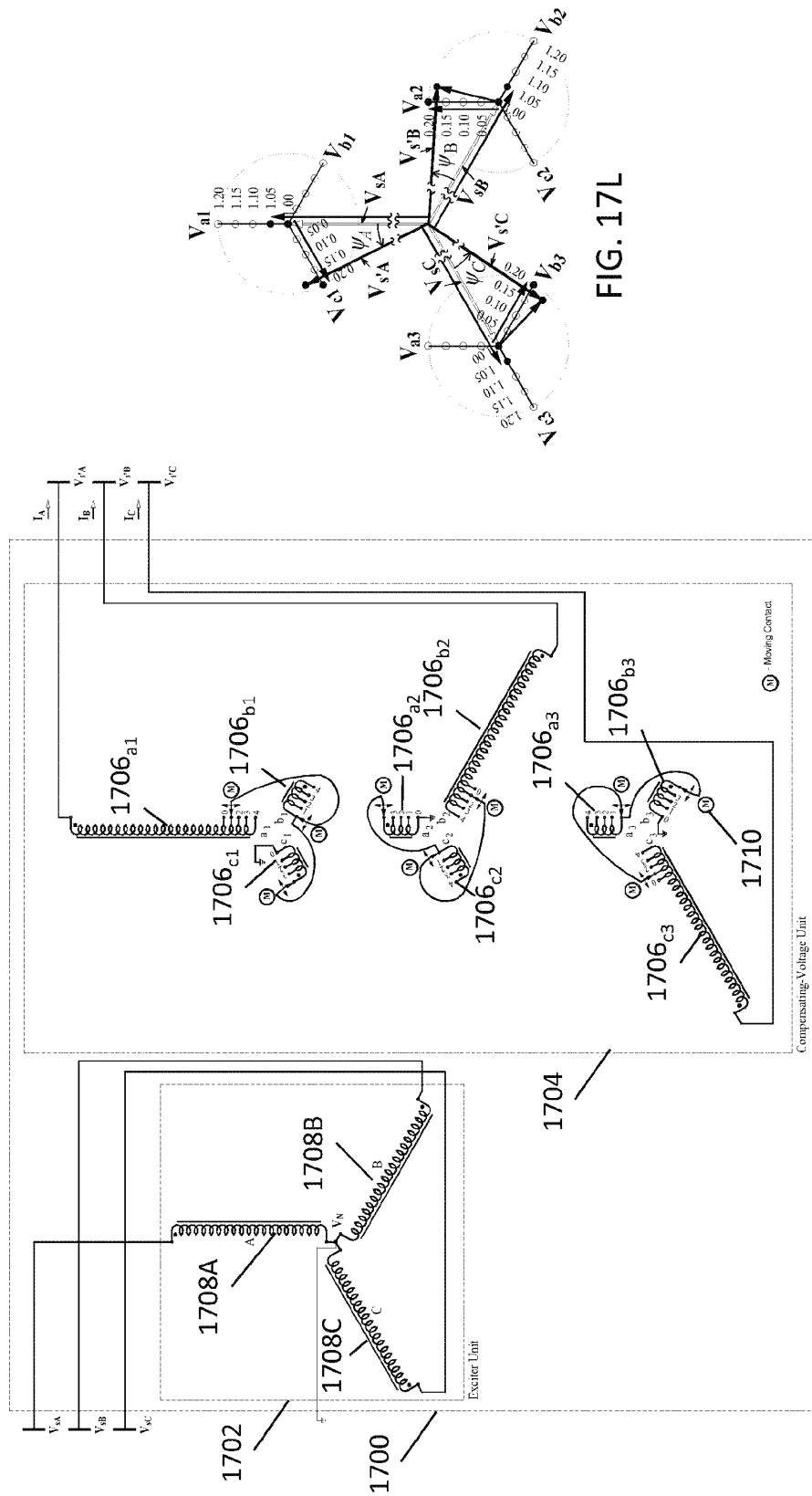


FIG. 17K

Sen Transformer (Shunt-Shunt)

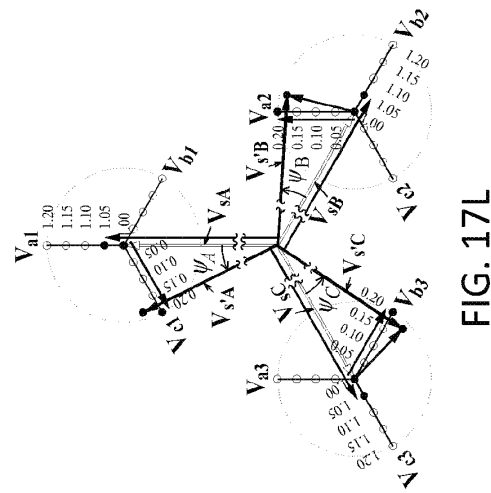
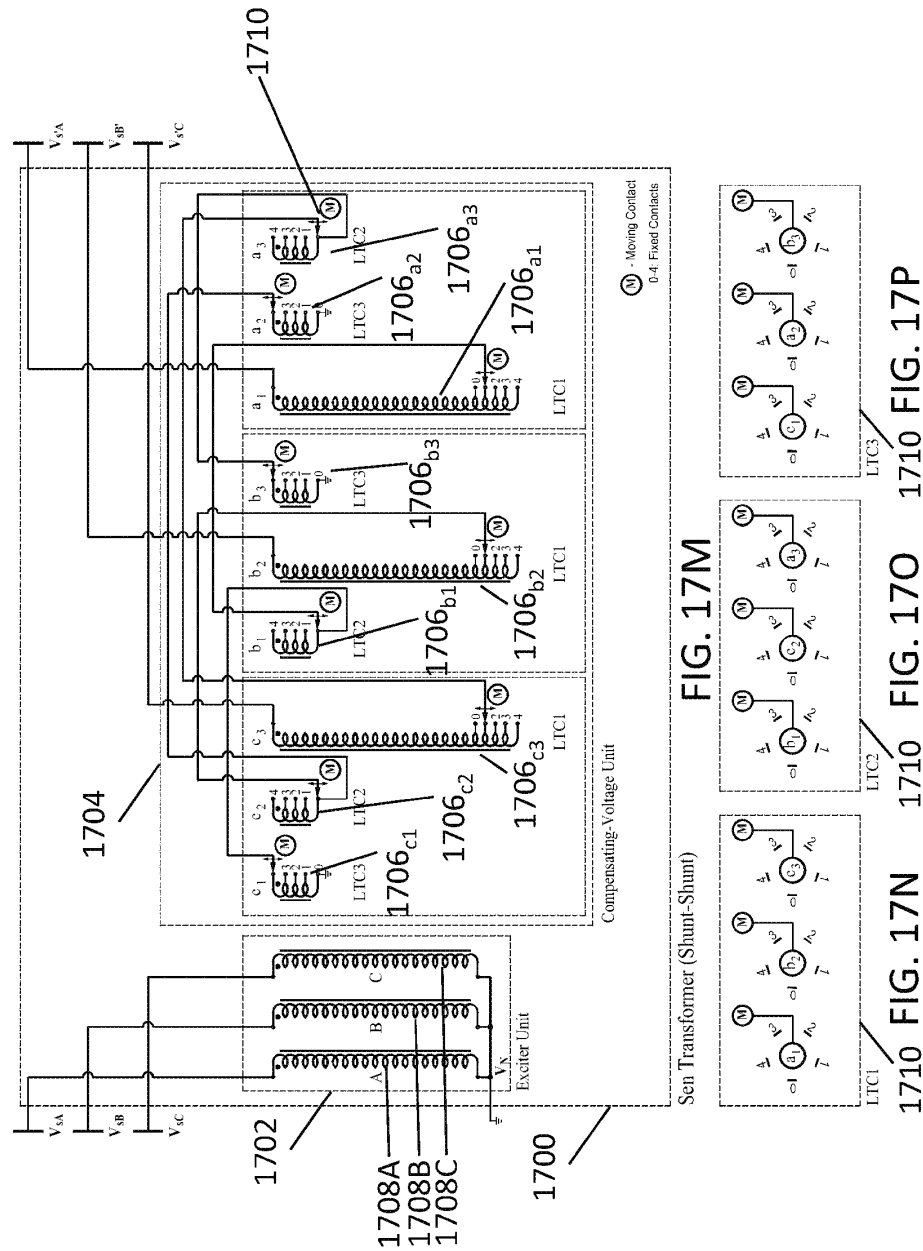


FIG. 17L



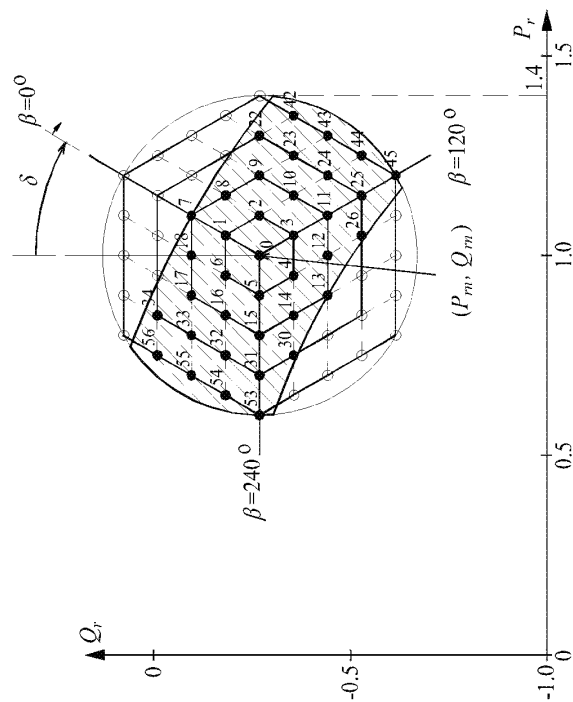


FIG. 17R

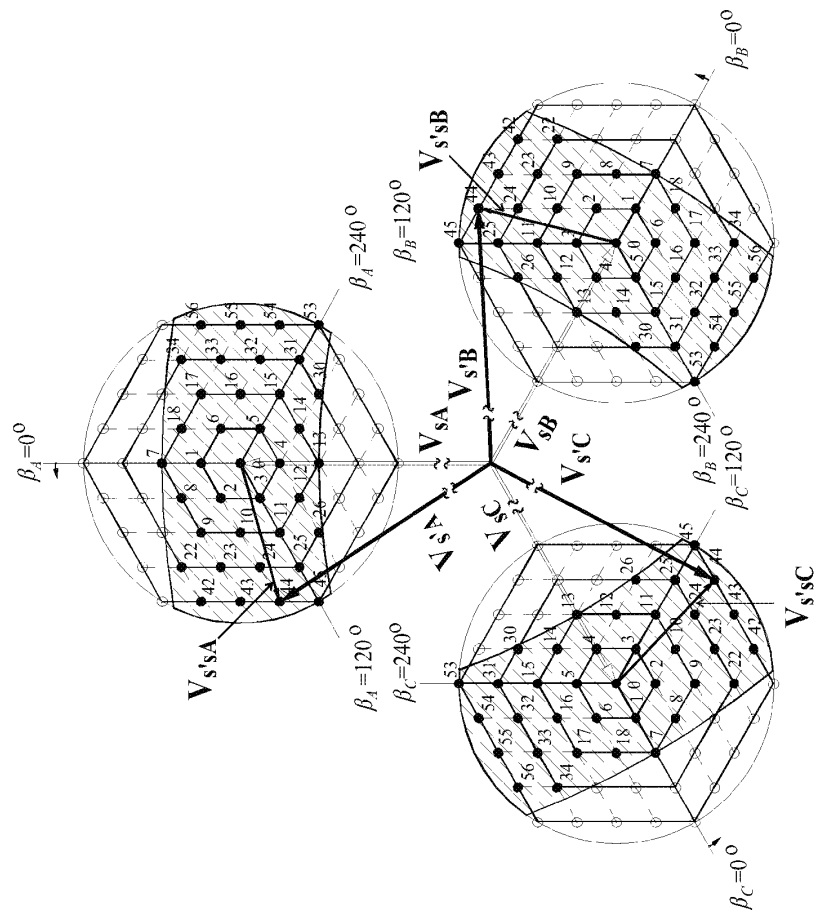


FIG. 17Q

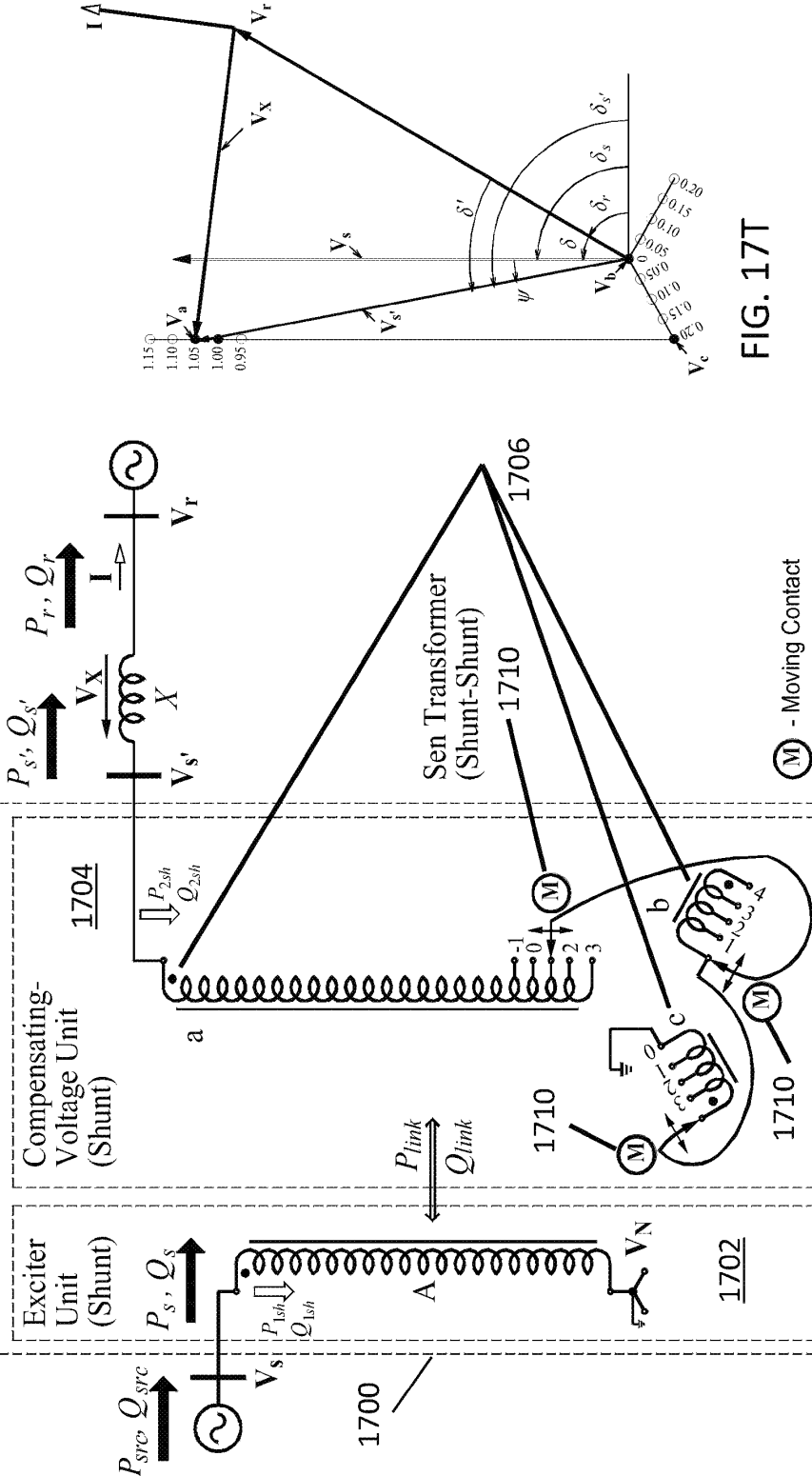


FIG. 17S

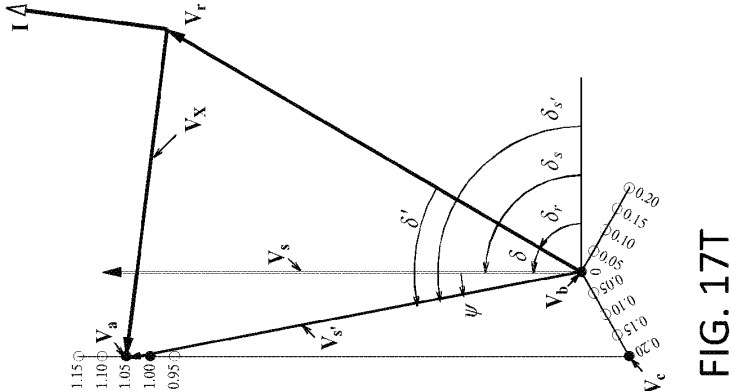


FIG. 17T

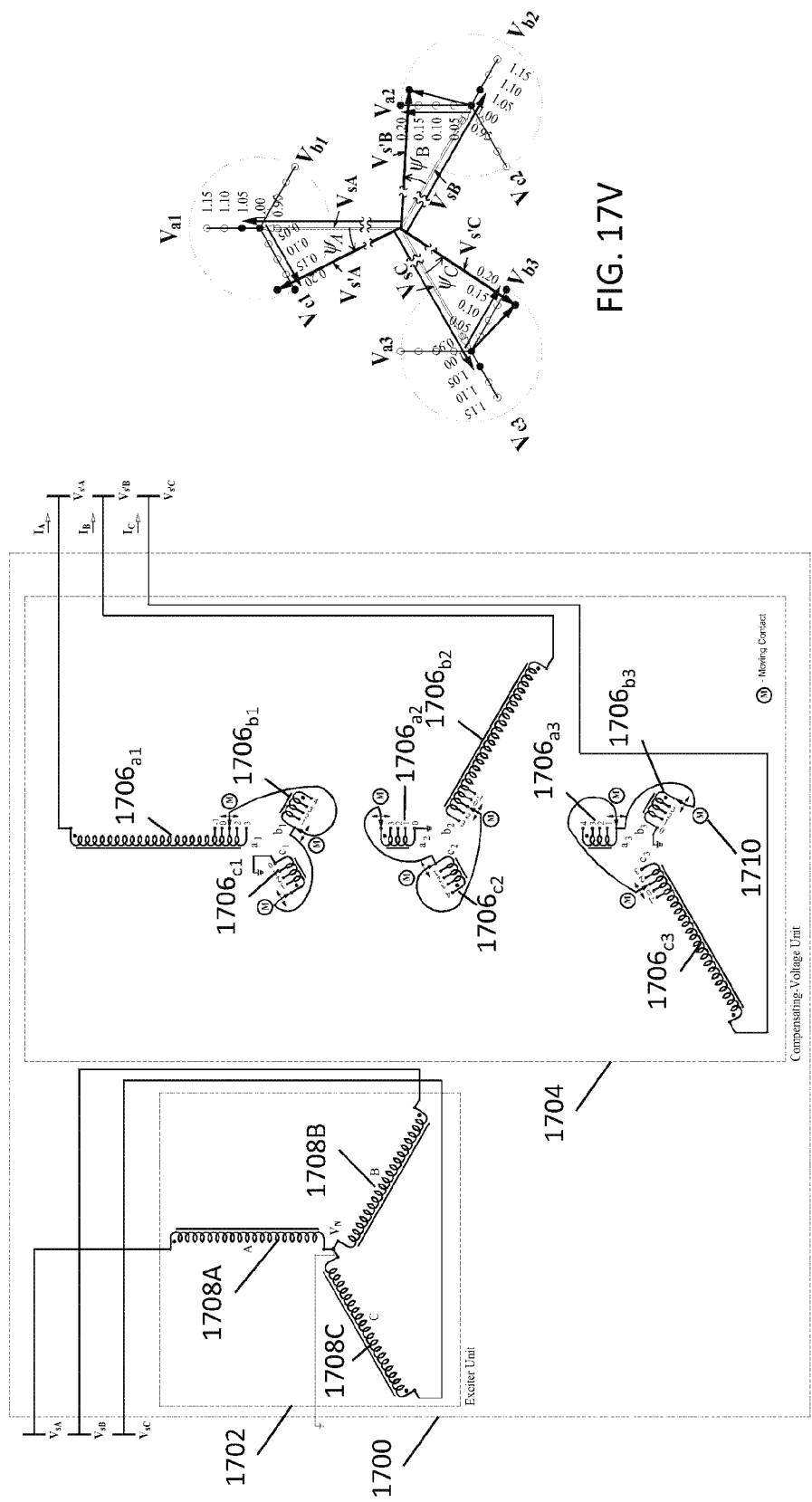
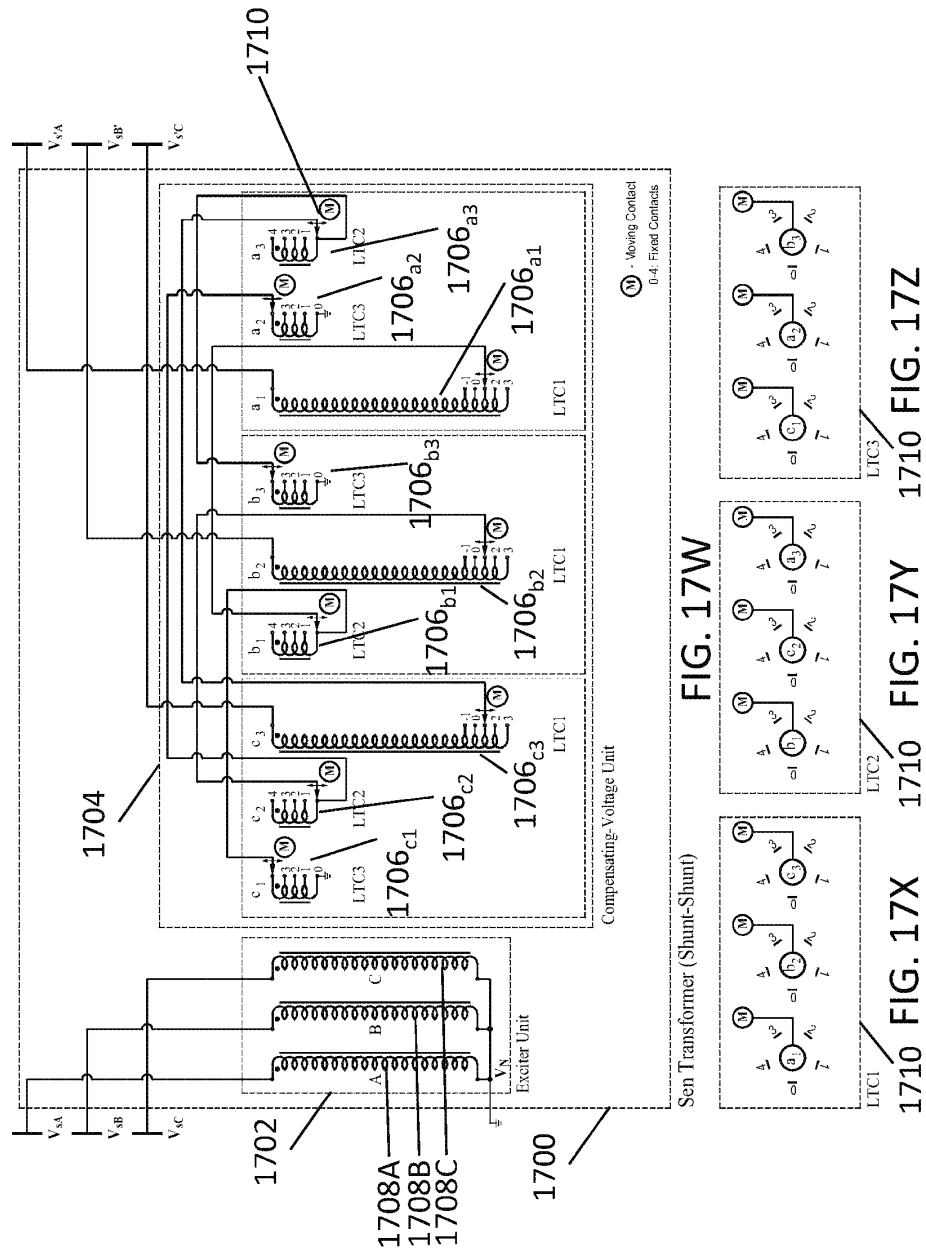


FIG. 17V



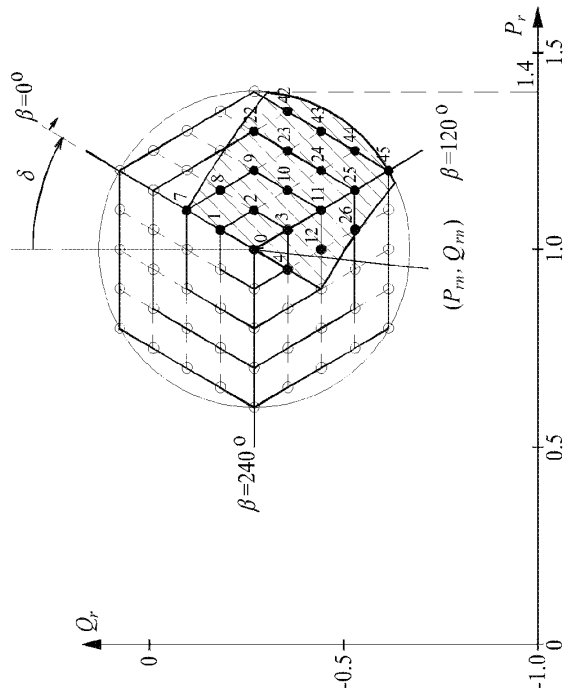


FIG. 17AB

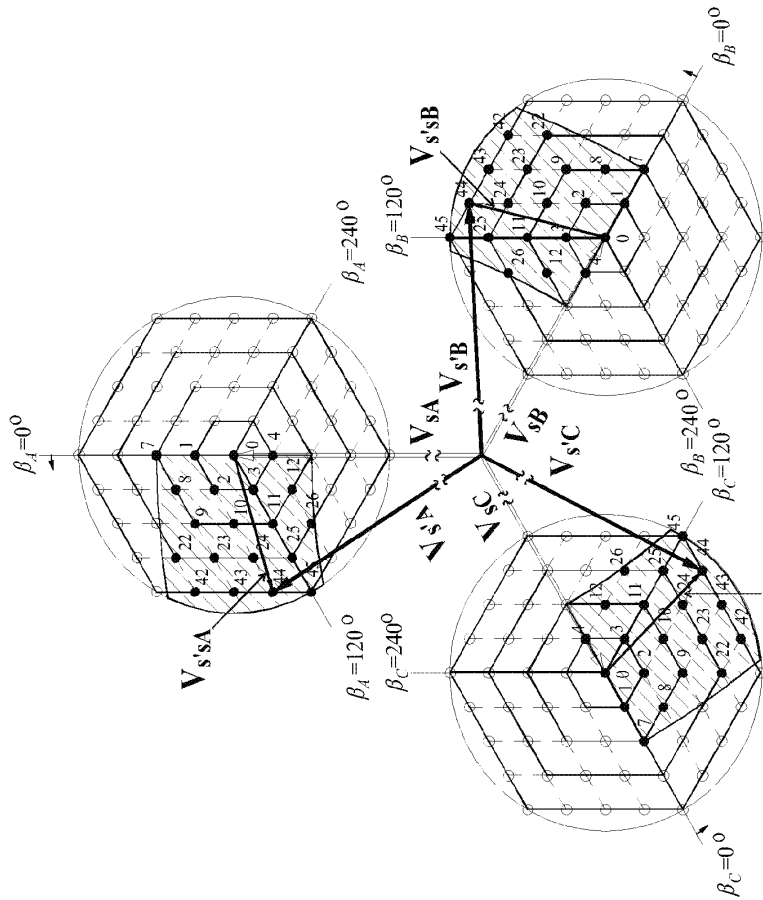


FIG. 17AA

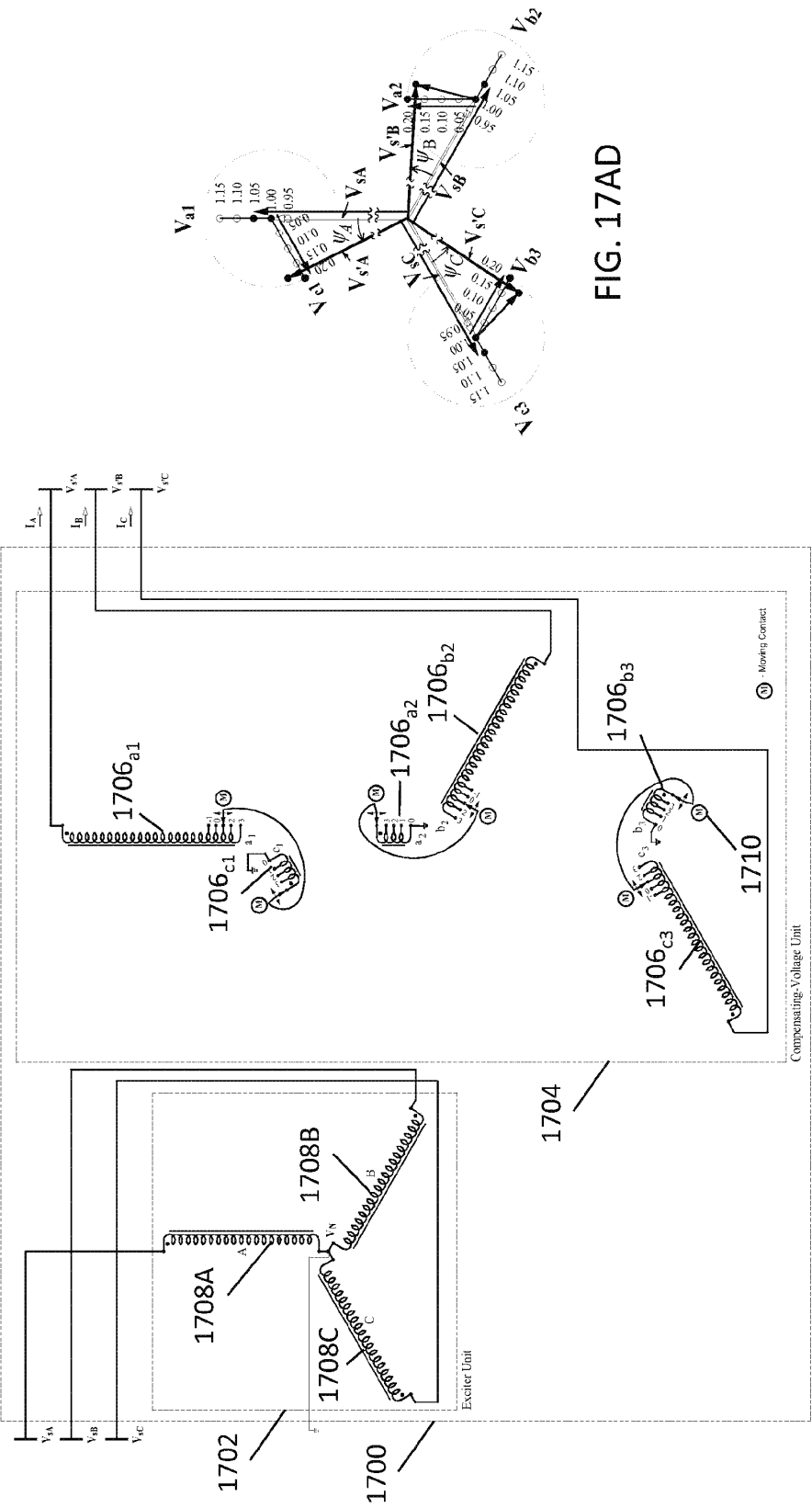


FIG. 17AC

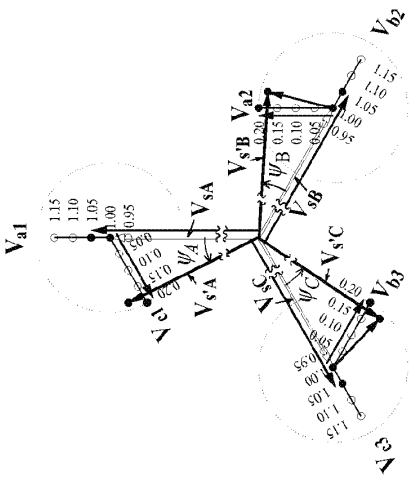


FIG. 17AD

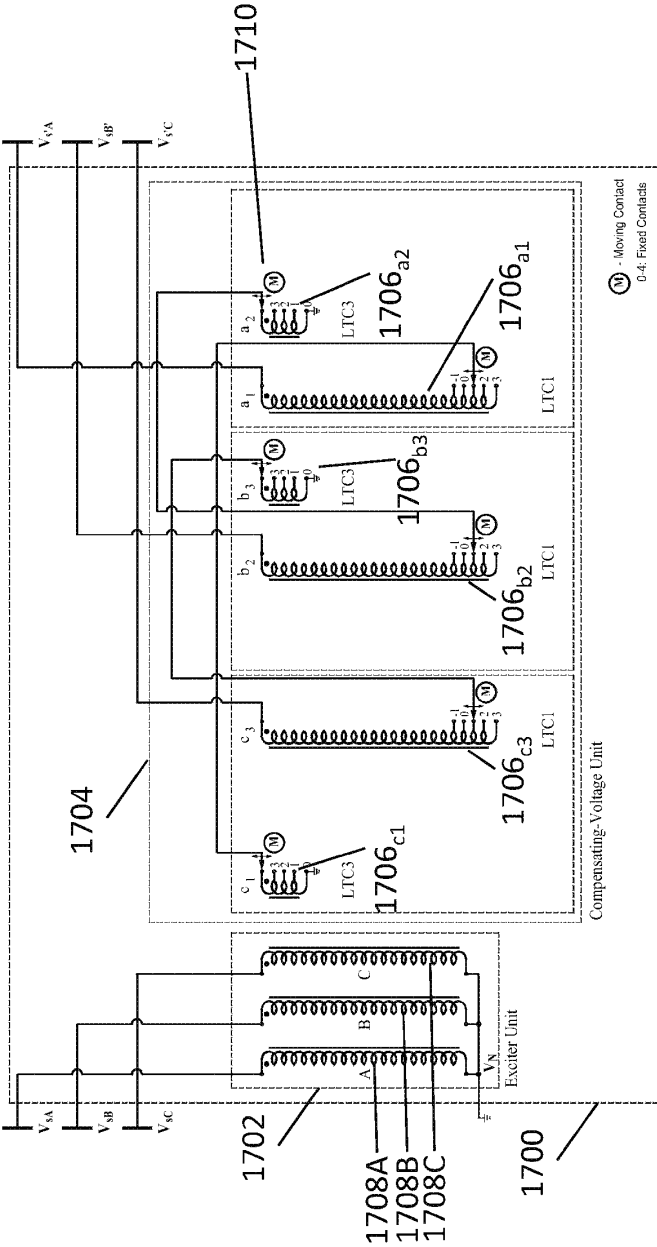


FIG. 17AE

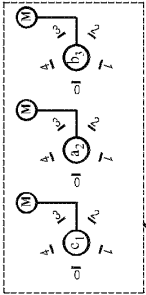


FIG. 17AG

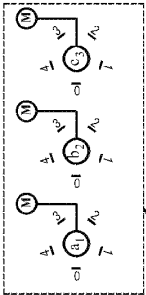


FIG. 17AF

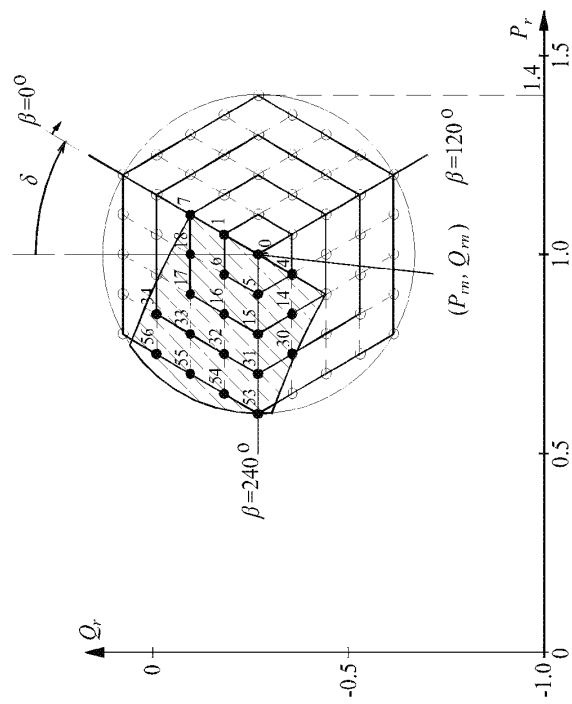


FIG. 17AI

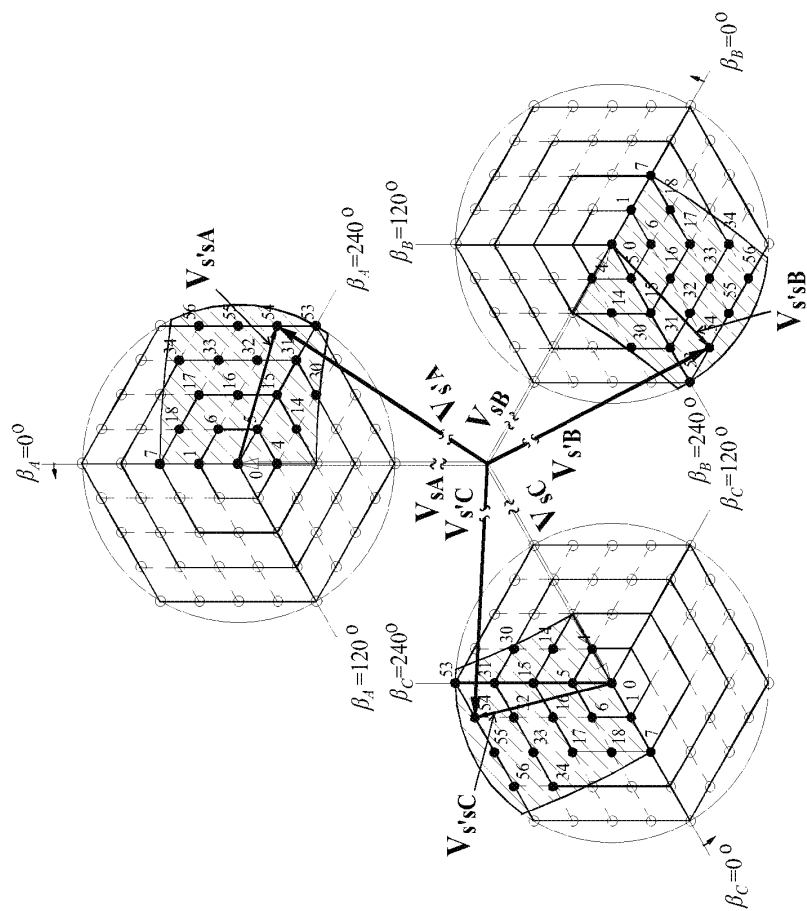


FIG. 17AH

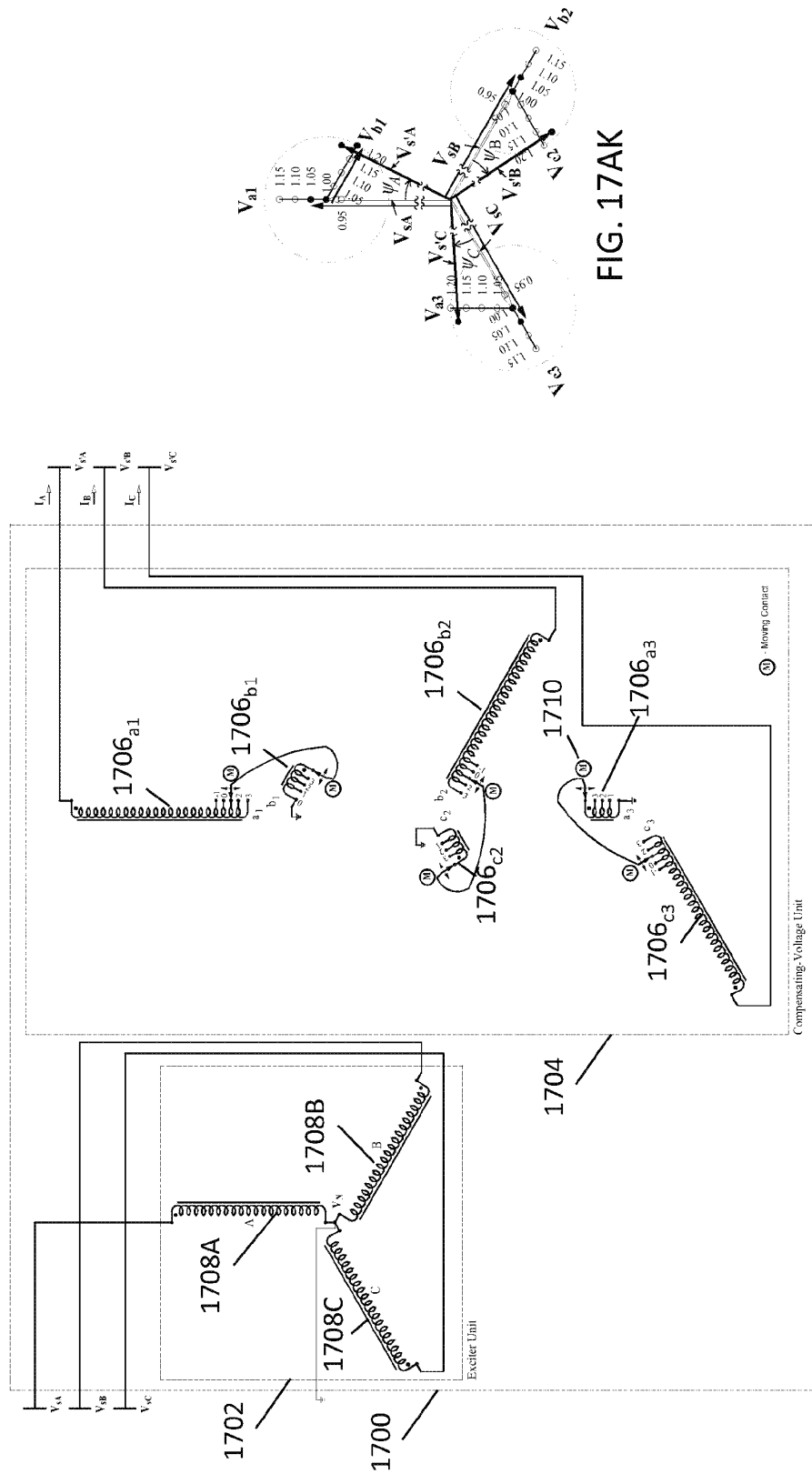


FIG. 17AJ

Sen Transformer (Shunt-Shunt)

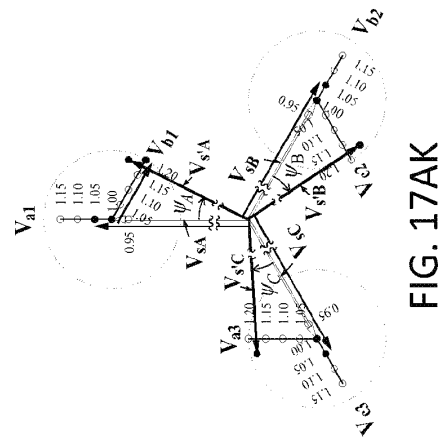
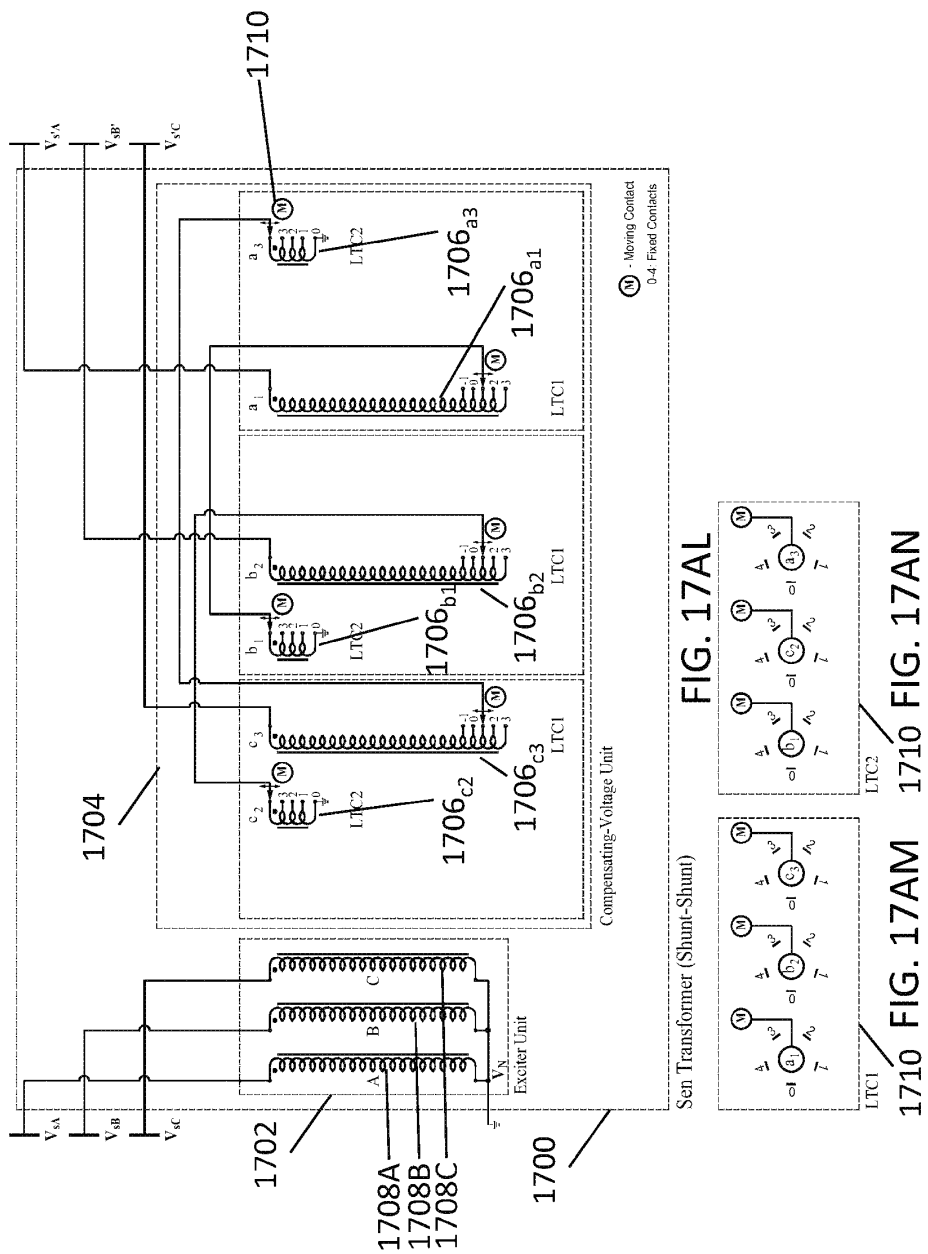


FIG. 17AK



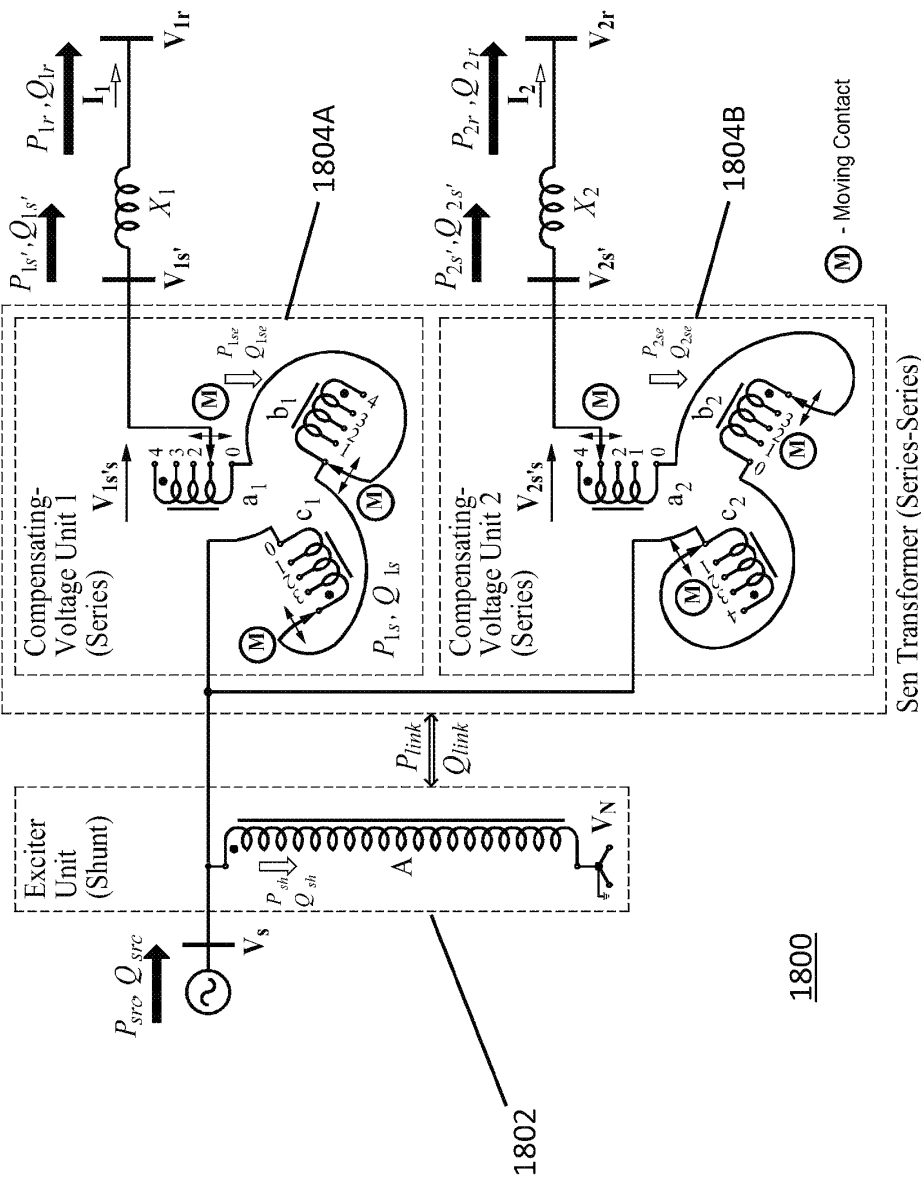


FIG. 18A

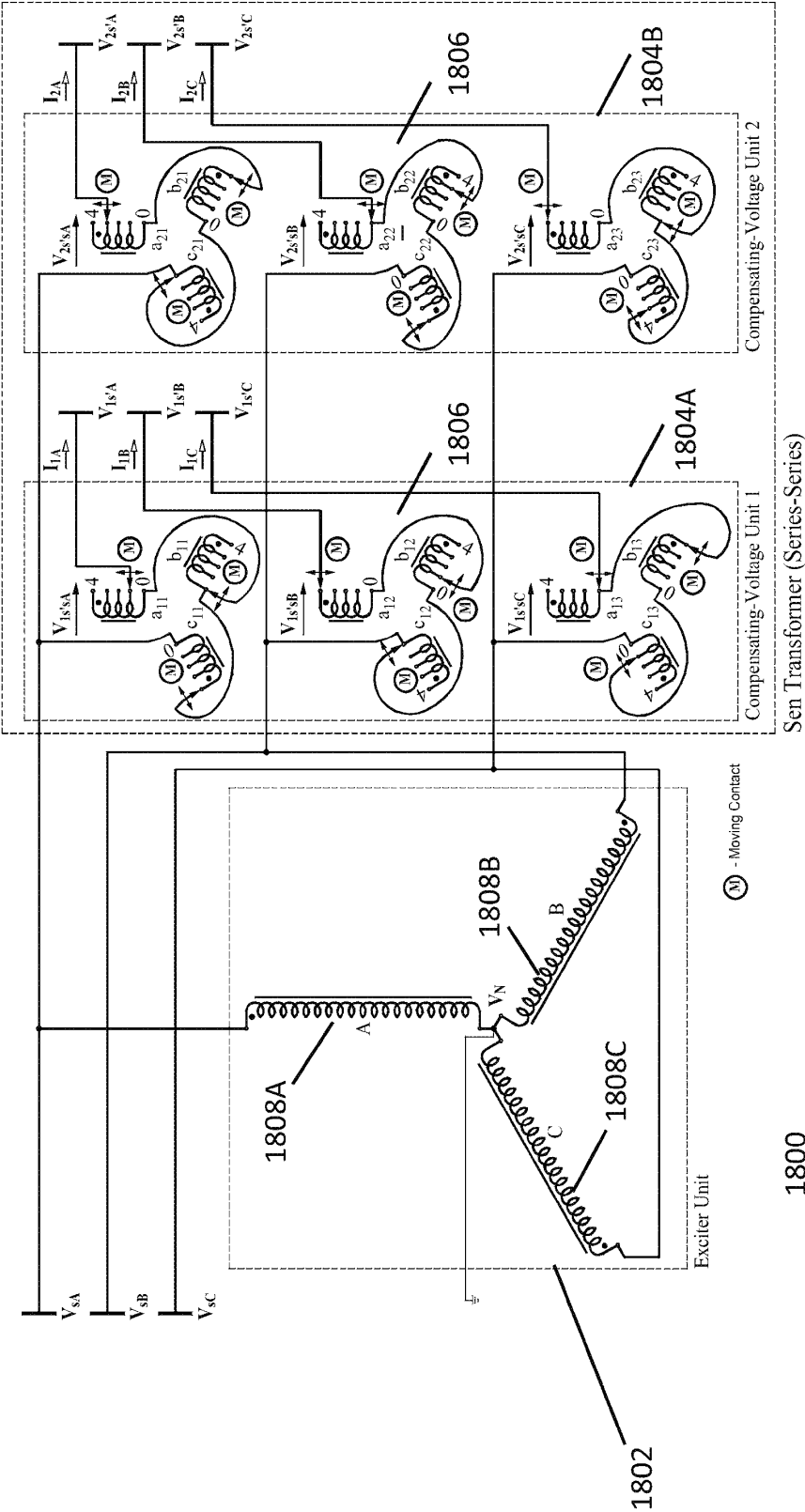


FIG. 18B

1800

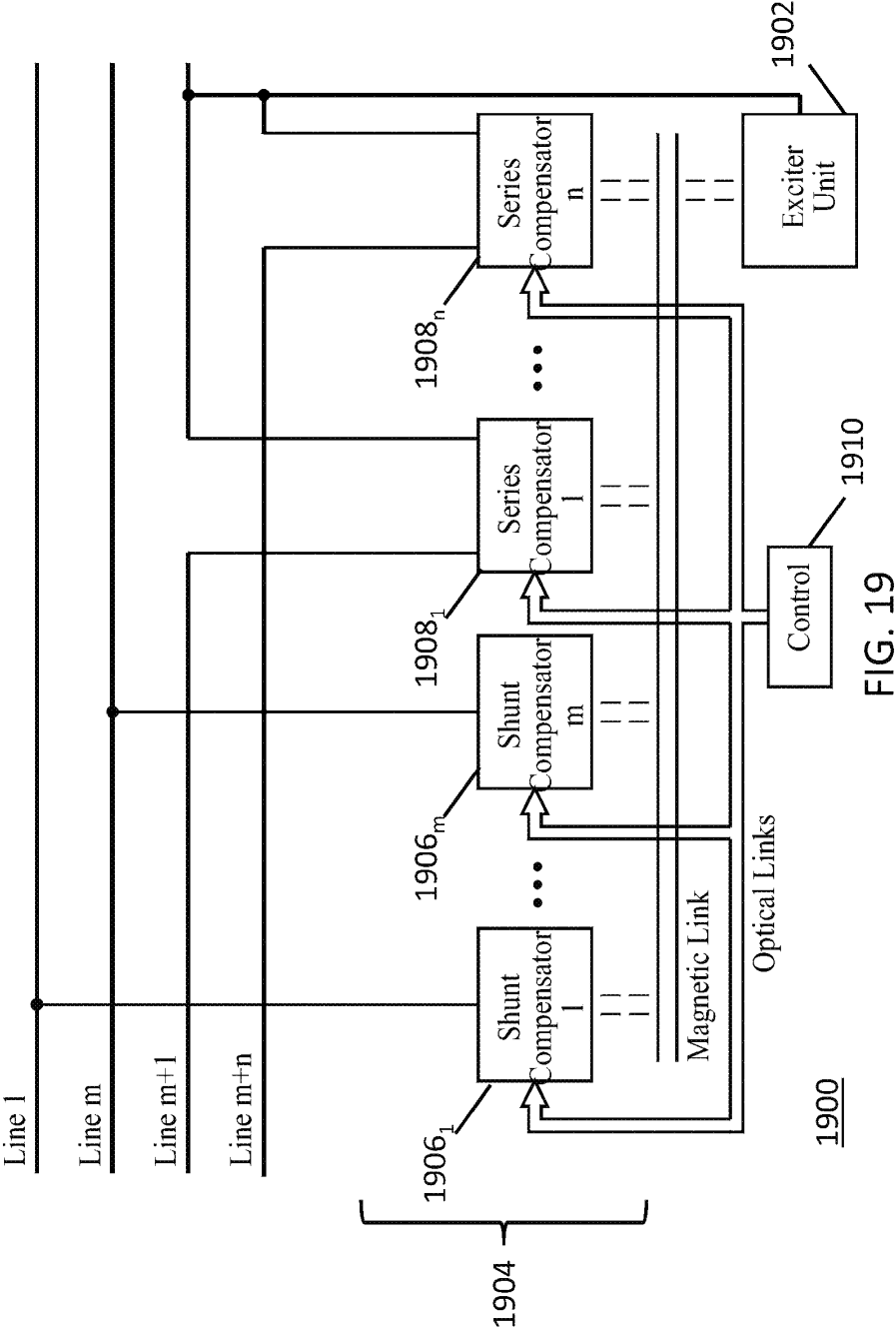


FIG. 19

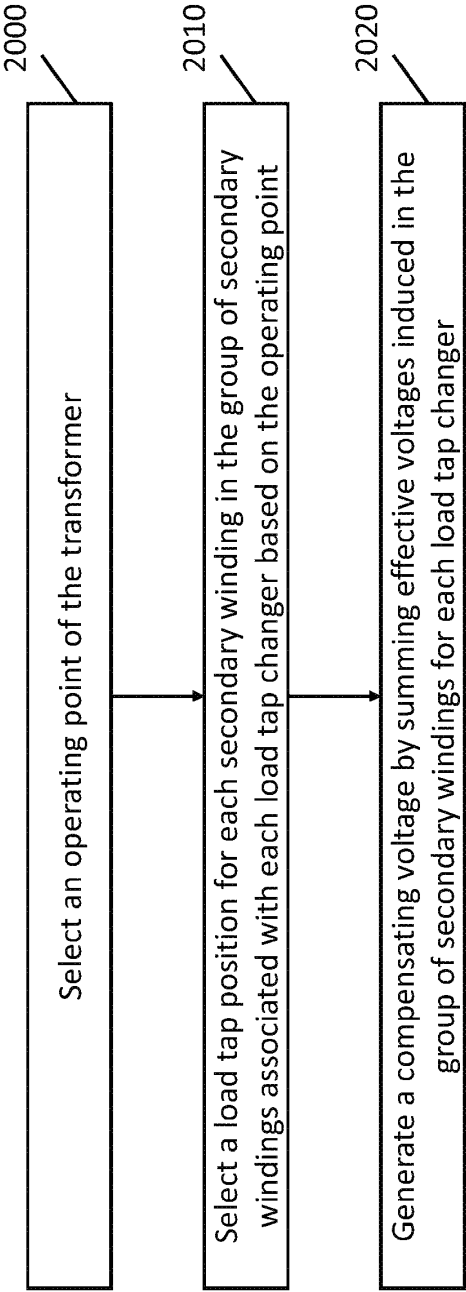


FIG. 20