

FIG.1

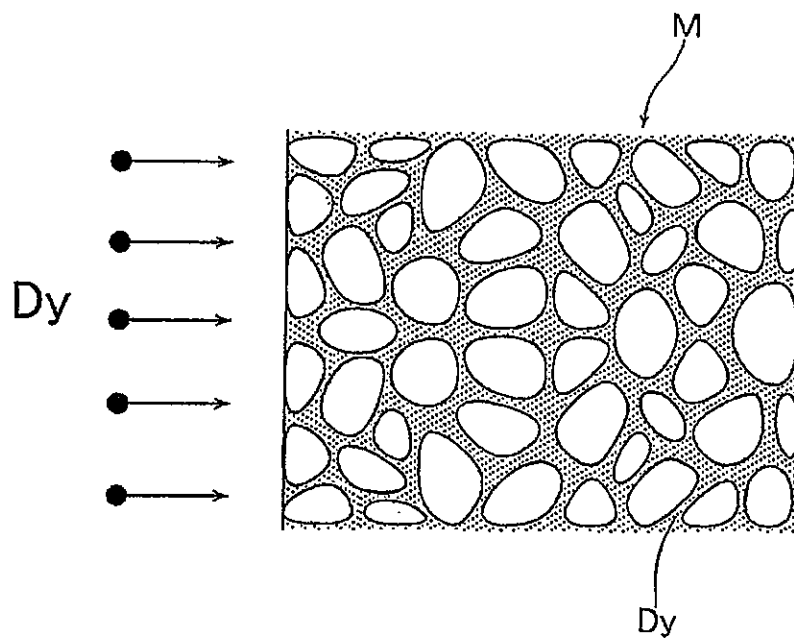
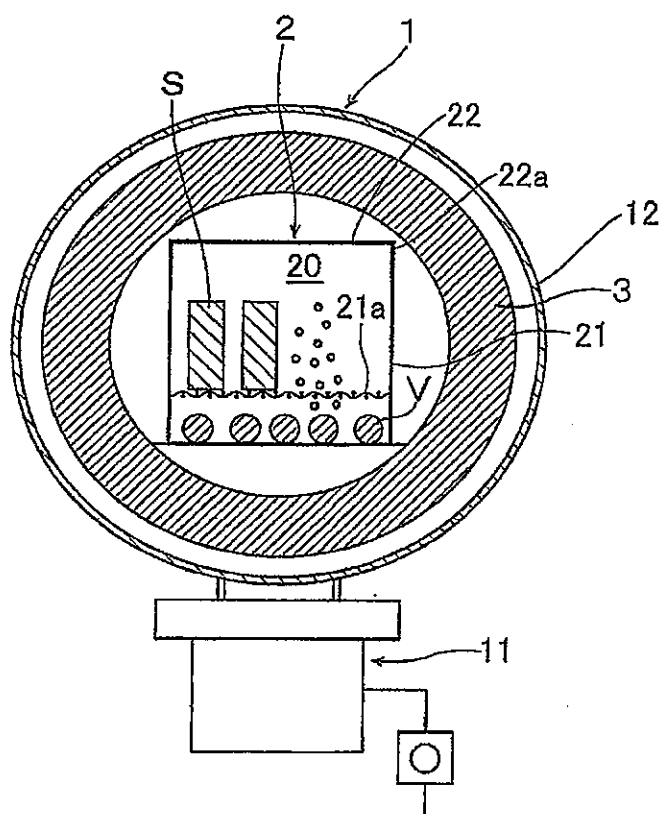
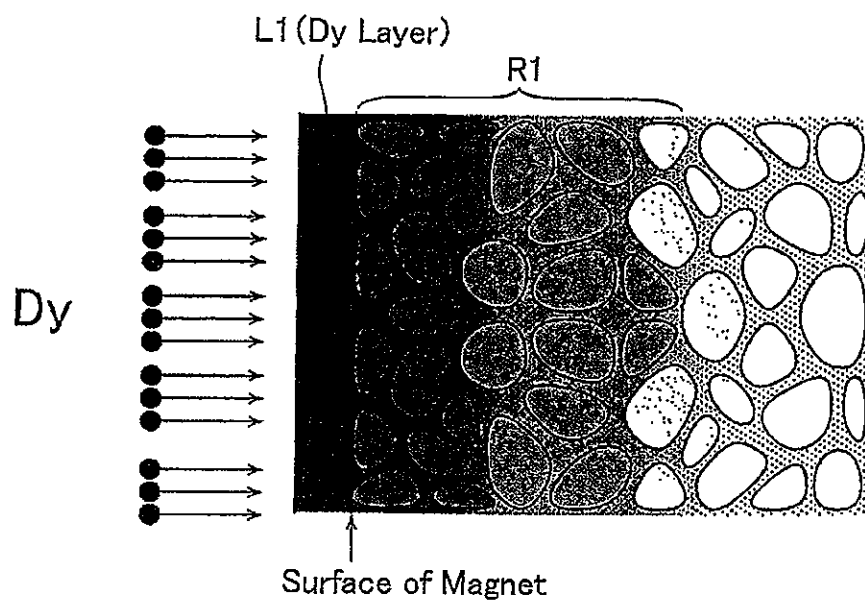


FIG.2



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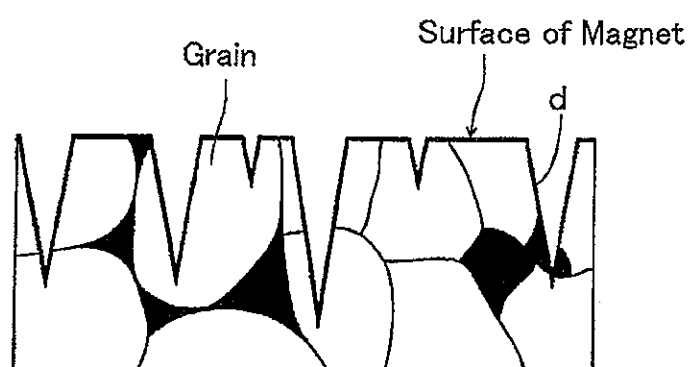
FIG.3



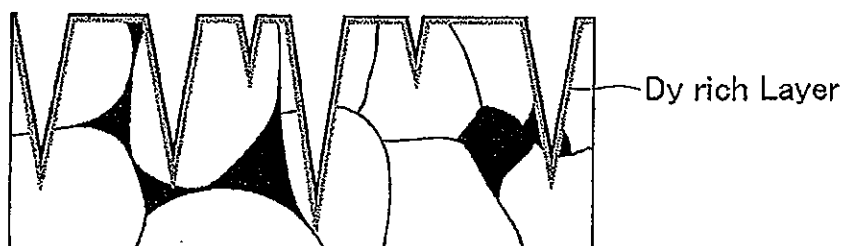
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FIG.4

(a)



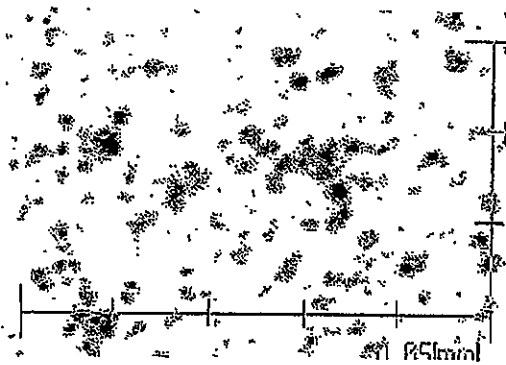
(b)



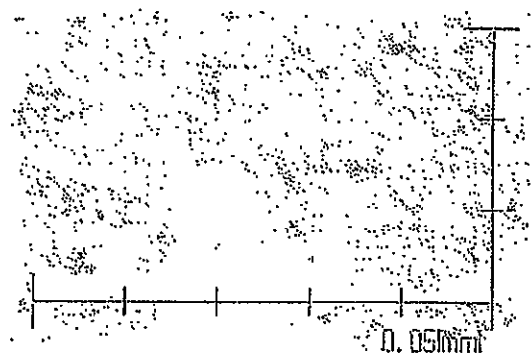
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FIG.5

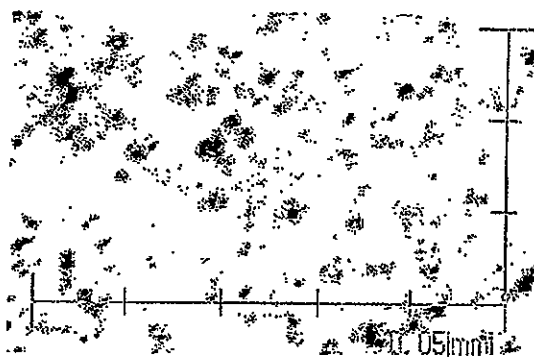
(a)



(b)



(c)



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FIG.6

	Before process	After process (975°C)
Br(kG)	14.5	14.3
iHc(kOe)	11.3	23.1
(BH)max(MGOe)	50.5	49.9
Weight increase ratio(%)	—	0.45
(BH)max+iHc	61.8	73

FIG.7

	Dy configuration	Dy surface area/ sintered magnet surface area	Br(kG)	iHc(kOe)	(BH) _{max} (MG0e)	(BH) _{max} +iHc
Non-film	—	(Non-treated)	14.6	10.5	51.8	62.3
	Bulky (φ 1mm)	5.3E-05	14.6	11.8	51.6	63.4
	Bulky (φ 1mm)	7.0E-05	14.6	14.5	52.4	66.9
	Bulky (φ 1mm)	1.1E-04	14.6	19.8	51.6	71.5
	Bulky (φ 1mm)	5.7E-04	14.6	19.8	51.6	71.5
	Bulky (φ 2mm)	2.1E-03	14.6	21.6	52.1	73.7
	Bulky (φ 2mm)	6.5E-03	14.6	22.1	52.0	74.1
	Bulky (φ 5mm)	1.2E-02	14.6	23.9	51.5	75.4
	Bulky (φ 5mm)	6.4E-02	14.6	23.6	52.0	75.7
	Bulky (φ 5mm)	1.8E-01	14.6	23.7	52.0	75.6
	Bulky (φ 3mm)	7.0E-01	14.6	23.7	51.8	75.6
	Bulky (φ 1mm)	1.4E+00	14.6	23.8	52.1	75.9
	Granular (0.4mm)	6.7E+00	14.6	23.7	51.9	75.6
	Granular (0.4mm)	1.1E+01	14.6	23.5	52.2	75.7
	Granular (0.4mm)	6.8E+01	14.5	22.7	51.4	74.1
	Granular (0.01mm)	1.6E+02	14.5	21.4	51.4	72.8
	Granular (0.01mm)	5.6E+02	14.5	20.9	51.7	72.6
	Granular (0.01mm)	1.6E+03	14.4	19.6	51.0	70.5
Film	Granular (0.01mm)	4.8E+03	13.8	15.4	46.9	62.3
	Granular (0.01mm)	6.0E+03	13.7	14.5	45.1	59.6

FIG.8

Average grain diameter of sintered magnet (μ m)																
	0.5	1	2	3	4	5	6	7	8	9	10	12	15	20	25	
Br(kG)		14.3	14.4	14.8	14.7	14.4	14.2	14.4	14.8	14.9	15	15.2	15.2	15.2	13.8	
(BH) _{max} (MG0e)	47	50	52	54	53	51	48	51	53	54	55	58	58	58	46	
iHc(k0e)	40	36	34	32	31	30	27	30	32	34	34	32	32	30	25	
Optimum vacuum vapor processing hour (hr)	72	24	18	12	10	8	6	5	2	1	1	1	1	1	1	
Comparative Example	Present Invention						Comparative Example	Present Invention						Comparative Example		

FIG.9

	Vacuum vapor processing	Component of magnet	Optimum vapor processing time(hr)	Br(kG)	(BH) ^{max} (MG0e)	iHc(k0e)	Evaluation of corrosion resistance
Embodi- ment 4	Not-perfo rmed	27Nd-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.4	51.2	11.4	6 hr or less
	Performed		2	15.5	59	18	120 hr or more
Compar- ative Example 4a	Not-perfo rmed	27Nd-1Co-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.3	51	11.3	24 hr or less
	Performed		10	15.3	58	17	120 hr or more
Compar- ative Example 4b	Not-perfo rmed	27Nd-4Co-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.4	52	11.1	48 hr or more
	Performed		22	15.2	56	16.5	120 hr or more
Compar- ative Example 4c	Not-perfo rmed	27Nd-8Co-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.4	52	11	72 hr or more
	Performed		32	15.1	55	16.4	120 hr or more

FIG. 10

		Temperature of vapor processing (°C)							
	Not-vapor process-ing	750	800	850	900	950	1000	1050	1100
Br(kG)	14.2	14.3	14.6	14.7	14.8	14.9	14.7	14.6	14
(BH) _{max} (MG _{Oe})	49	49.5	50	52	54	54	54	51	48
iHc(kOe)	14.5	15.8	22	24	26	27	26	24	16
Weight increase fore and aft vapor processi-ng (wt%)	—	0.01	0.05	0.1	0.3	0.4	0.6	0.8	1.5
	Comparative Example	Present Invention							Comparative Example

FIG. 11

		Temperature of vapor processing (°C)							
	Not-vapor proces-sing	850	900	950	1000	1050	1100	1150	1200
Br(kG)	14.2	14.3	14.6	14.7	15.3	15.4	14.7	14.6	13
(BH) _{max} (MG0e)	49	49.5	50	52	57.4	58.1	54	51	40
iHc(kOe)	14.5	15.8	21	23	29	30	29	28	8
	Comparative Example	Present Invention							Comparative Example

FIG.12

	Average grain diameter of sintered magnet (μm)														
	0.5	1	2	3	4	5	6	7	8	9	10	12	15	20	25
Br (kG)		14.3	14.4	14.6	14.6	14.3	14.1	14.4	14.8	15	15.1	15.2	15.2	15.2	13.8
(BH) _{max} (MG0e)	46.5	50.5	51	52.8	52.2	50.5	48	51	54	55.1	55	56	56	56	46
iHc (kOe)	40	36	34	32	31	30	27	30	32	32	32	32	31	30	25
Optimum diffusing process hour (hr)	72	36	18	12	8	8	6	4	2	1	1	1	0.5	0.5	1
Comparative Example		Present Invention					Comparative Example	Present Invention					Comparative Example		

FIG.13

	Vacuum vapor processing	Component of magnet	Optimum vapor processing time(hr)	Br(kG)	(BH)max (MG0e)	iHc(k0e)	Evaluation of corrosion resistance
Embodiment 8	Not-performed	28Nd-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.4	51.2	11.4	6 hr or less
	Performed		2	15.4	58	19.5	120 hr or more
Comparative Example 8a	Not-performed	28Nd-1Co-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.3	51	11.3	24 hr or less
	Performed		10	15.2	57	18.2	120 hr or more
Comparative Example 8b	Not-performed	28Nd-4Co-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.4	52	11.1	48 hr or more
	Performed		22	15.1	55	17.4	120 hr or more
Comparative Example 8c	Not-performed	28Nd-8Co-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.4	52	11	72 hr or more
	Performed		32	15	54	17	120 hr or more

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FIG.14

		Temperature of sintered magnet (°C)											
		Temperature of processing chamber (°C)	750	800	850	900	950	1000	1050	1100	1150	1200	1250
Br(kG)	900		14.3	14.6	14.7	14.8	14.9	14.7	14.6	14	13.5	12	11
(BH)max(MG0e)			49.5	50	52	54	56	54	51	48	44	30	21
iHc(k0e)			15.8	21	23	24	26	25	23	21	12	8	4
Br(kG)	850		14.3	14.6	14.7	14.8	14.9	14.7	14.6	14	13.5	12	11
(BH)max(MG0e)			49.5	50	52	54	56	54	51	48	44	30	21
iHc(k0e)			15.8	22	24	26	27	26	24	22	12	8	4
Br(kG)	800		14.3	14.6	14.7	14.8	14.9	14.7	14.6	14	13.5	12	11
(BH)max(MG0e)			49.5	50	52	54	56	54	51	48	44	30	21
iHc(k0e)			15.8	22	24	26	27	26	24	22	12	8	4
Br(kG)	750		14.3	14.6	14.7	14.8	14.9	14.7	14.6	14	13.5	12	11
(BH)max(MG0e)			49.5	50	52	54	56	54	51	48	44	30	21
iHc(k0e)			15.8	22	24	26	27	26	25	24	12	8	4
		Comparative Example	Present Invention								Comparative Example		

FIG.15

Average grain diameter of sintered magnet (μm)															
	0.5	1	2	3	4	5	6	7	8	9	10	12	15	20	25
Br(kG)		14.4	14.4	14.7	14.7	14.4	14.1	14.5	14.9	15.1	15.2	15.3	15.3	15.3	13.8
(BH) _{max} (MG0e)	46.5	51.5	52	53.6	53.3	51.5	48	52	55	56.1	56	57	57	57	46
Ir(kOe)	36	34	32	30	29	28	25	28	30	30	30	30	29	28	23
Optimum diffusing process hour (hr)	72	36	18	12	8	8	6	4	2	1	1	1	0.5	0.5	1
	Comparative Example	Present Invention				Comparative Example				Present Invention				Comparative Example	

FIG.16

	Vacuum vapor processing	Component of magnet	Optimum vapor processing time(hr)	Br(kG)	(BH) _{max} (MG0e)	iHc(k0e)	Evaluation of corrosion resistance
Embodiment 11	Not-performed	21Nd-7Pr-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.4	51.2	10.8	2 hr or less
	Performed		4	15.4	58	20.5	120 hr or more
Comparative Example 11a	Not-performed	21Nd-7Pr-1Co-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.3	51	11.2	12 hr or less
	Performed		10	15.2	57	18.2	120 hr or more
Comparative Example 11b	Not-performed	21Nd-7Pr-4Co-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.4	52	11	36 hr or more
	Performed		22	15.1	55	17.4	120 hr or more
Comparative Example 11c	Not-performed	21Nd-7Pr-8Co-1B-0.05Cu-0.05Ga-0.1Zr-bal.Fe	—	14.4	52	10.8	48 hr or more
	Performed		32	15	54	16	120 hr or more

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FIG.17

		Temperature of heat treatment							
		Not-heat treatment	400	450	500	550	600	650	700
Sample 1	Br(kG)	14.4	14.4	14.5	14.6	14.6	14.6	14.5	14.4
	(BH)max(MGOe)	50.8	50.8	51.1	53.5	53.8	53.3	52.1	50.8
	iHc(kOe)	5.2	6.3	7.1	8.4	8.6	8.3	8.1	7.8
Sample 2	Br(kG)	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8
	(BH)max(MGOe)	53.7	53.7	53.7	53.7	53.7	53.7	53.7	53.7
	iHc(kOe)	12.1	18.2	20.5	22.1	24.6	26.5	24.8	23.6

