(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 289 979**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **88107032.0**

(51) Int. Cl.4: **H01F 1/37**

(22) Date of filing: **02.05.88**

(30) Priority: **02.05.87 JP 109382/87**

(43) Date of publication of application:
09.11.88 Bulletin 88/45

(84) Designated Contracting States:
DE FR GB

(71) Applicant: **SAWAFUJI CO., LTD.**
2-41-14, Kami-Ikebukuro
Toshima-ku Tokyo(JP)

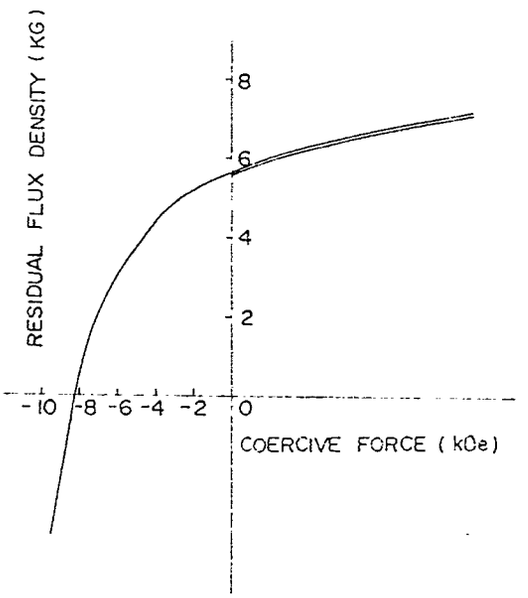
(72) Inventor: **Sawafuji, Tadashi**
2-41-14, Kami-Ikebukuro
Toshima-ku Tokyo(JP)

(74) Representative: **Münich, Wilhelm et al**
Kanzlei Münich, Steinmann, Schiller
Willibaldstrasse 36/38
D-8000 München 21(DE)

(54) Plastic magnets.

(57) Plastic magnets comprising Nd-Fe-B group alloys powder, ferrite magnetic powder and phenol resin binding agent offering lowerintermediary-high magnetic power as desired.

Fig. 1



Br :	B(H-O)	5.6693	KG
	BHmax	6.4763	MGOe
iHc :	H(I-O)	-8.0877	kOe

EP 0 289 979 A1

PLASTIC MAGNETS

BACKGROUND OF THE INVENTION

Field of the Invention:

The present invention relates to plastic magnets and, in particular, to plastic magnets comprising two types of magnet powder (ie Nd-Fe-B group alloys and ferrite) in random desired ratios bonded by phenol resin.

Description of the Prior Art:

Various types of plastics magnets wherein magnet powders are bonded by resins such as those comprising Ba Ferrite or Sr Ferrite magnet powder bonded by resin or rare-earth magnet powder bonded by resin, have been conventionally known and such magnets are utilized in small motors, acoustic transducers. health instruments and the like.

Of the various above-mentioned plastic magnets, the ferrite plastic magnets are priced low but have very low magnetic strength while the rare-earth alloy plastic magnets are highly priced while offering extremely powerful magnetic strength.

It is a fact, however, that plastic magnets need to possess only as much magnetic strength as an application might require and need not be of extremely powerful magnetic strength at all instances.

Conventionally, however, plastic magnets are known to be of either low magnetic power or high magnetic power as described above.

Summary of the Invention:

The present invention has been researched in view of the above-mentioned problem points and, in other words, is to provide plastic magnets having the characteristics of composite moulded pieces comprising Nd-Fe-B group alloys powder, ferrite magnet powder and with phenol resin as the binder.

DETAILED DESCRIPTION OF THE INVENTION

Nd-Fe-B group alloys used in the present invention indicate the alloys comprising not only Nd-Fe-B but also addition of a small amount of Co or other substances to the alloys.

Ferrite magnet powder herein employed may be welknown ferrite magnets comprising Fe_2O_3, NiO, CuO, ZnO and the like, Ba Ferrite magnet, Sr Ferrite magnet.

For the resin binder. it is desirable to use phenol resin binder wherein resins comprising phenols (phenol, cresol, resorcin) and aldehydes (formaldehyde, aceto-aldehyde, furfural) or denatured resin thereof and where these may be prepared, for example, by having the phenol and formaldehyde react with acid or alkali as a catalyst.

The use of a phenol resin binder prevents the above-mentioned powders to disperse unevenly due to variance in the respective specific gravities. In other words, the preliminary heating and drying treatment effects to form light resin costs on the surface of the powder particles resulting in granules of slightly viscous nature and while the granules may have variance in specific gravities, the movement thereof is thus limited making the magnets homogenous as long as the granules are mixed evenly.

The two types of magnet powder, Nd-Fe-B group alloys and ferrite, in random desired ratios are uniformly bonded with phenol resin, thereby enabling the production of plastic magnets of desired stages of magnetic power from low to intermediarly to powerful.

Moreover, the use of phenol resin binder has quaranteed ease of production, excellent thermal characteristics and mechanical strength of the products.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1 to 5 are the graphs showing respectively the magnetic characteristics in varying the ratios of Nd-Fe-B group alloys powder and ferrite powder such as 20:80, 30:70, 40:60, 80:20 and 85:15 (weight %), respectively.

Examples:

The following gives a concrete discription of an example of a plastic magnet of the present invention.

Ferrite powder of average particle size 5μm comprising Fe_2O_3, MnO, ZnO and Nd-Fe-B group alloy powder of average particle size 200μm are mixed in are ratio of 20:80 (by weight) respectively. 5 weight % of phenol resin monomer and 2 weight % of methanol are added thereto and the resulting mixture is kneaded, and subsequently heated and dried for 10 minutes at 100°C - 120°C.

The resulting granual mixture was heated and compression moulded at pressure 1000 kg/cm^2, 160°C for about 5 minutes to obtain the moulded piece. De-gassing was effected once during the above process.

Subsequently, the moulded piece was magnetized by powerful magnetic field to obtain plastic magnet of homogeneous texture.

Furthermore, plastic magnets of varying ratios of the abovementioned ferrite powder and Nd-Fe-B group alloy powder such as 30:70, 40:60, 80:20, 85:15 (weight) were produced in methods identical to the above-mentioned method.

The results thereof (BH max, Br, etc.) are given in Figs. 1 to 5.

While, in the example cited above, magnetization was effected on moulded pieces obtained by thermal hardening, it is also possible to magnetize the pieces simultaneously to heating and compression moulding and thereby obtain plastic magnets (anisotropic) of greater magnetic power.

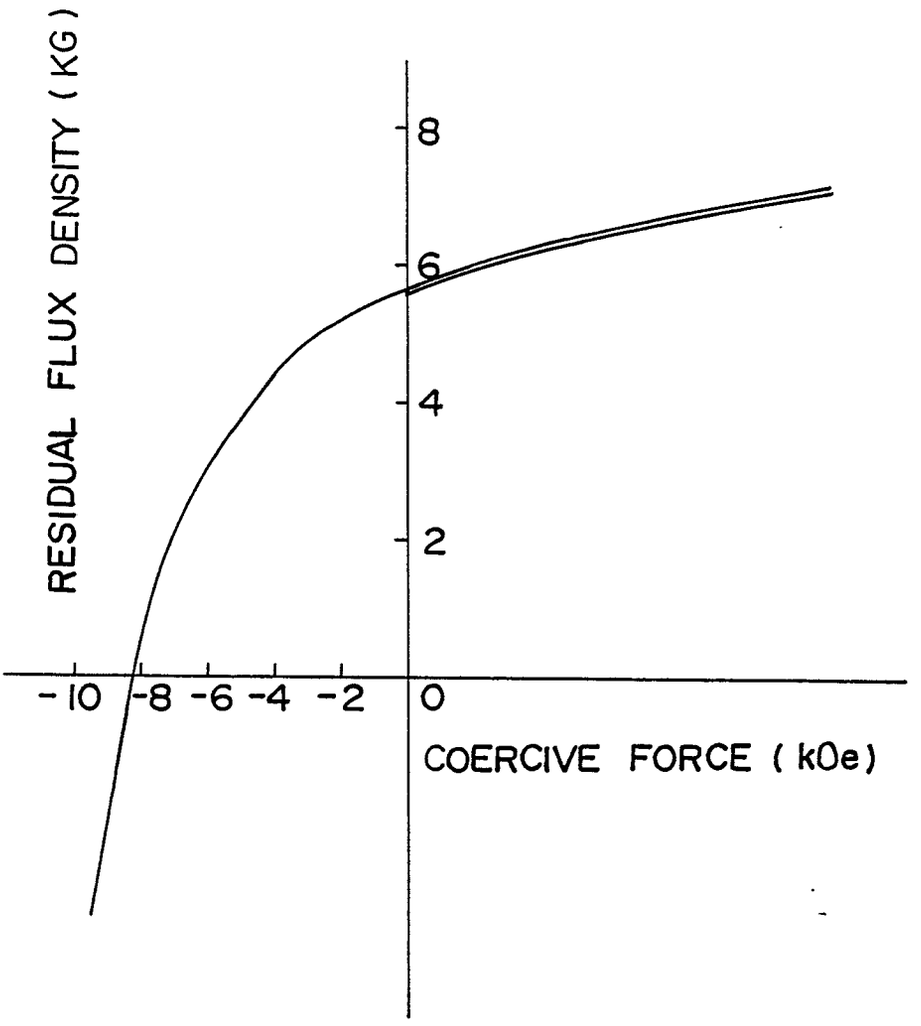
As described in detail above plastic magnets of the present invention comprise Nd-Fe-B group alloy and ferrite magnet mixed in random desired ratios and as such the present invention offers plastic magnets of low-intermediary-high magnetic power as desired.

Moreover, the use of phenol resin binder allows for plastic magnets of excellent thermal characteristic and tenacity and well suited for large motors and acoustic transducers.

Claims

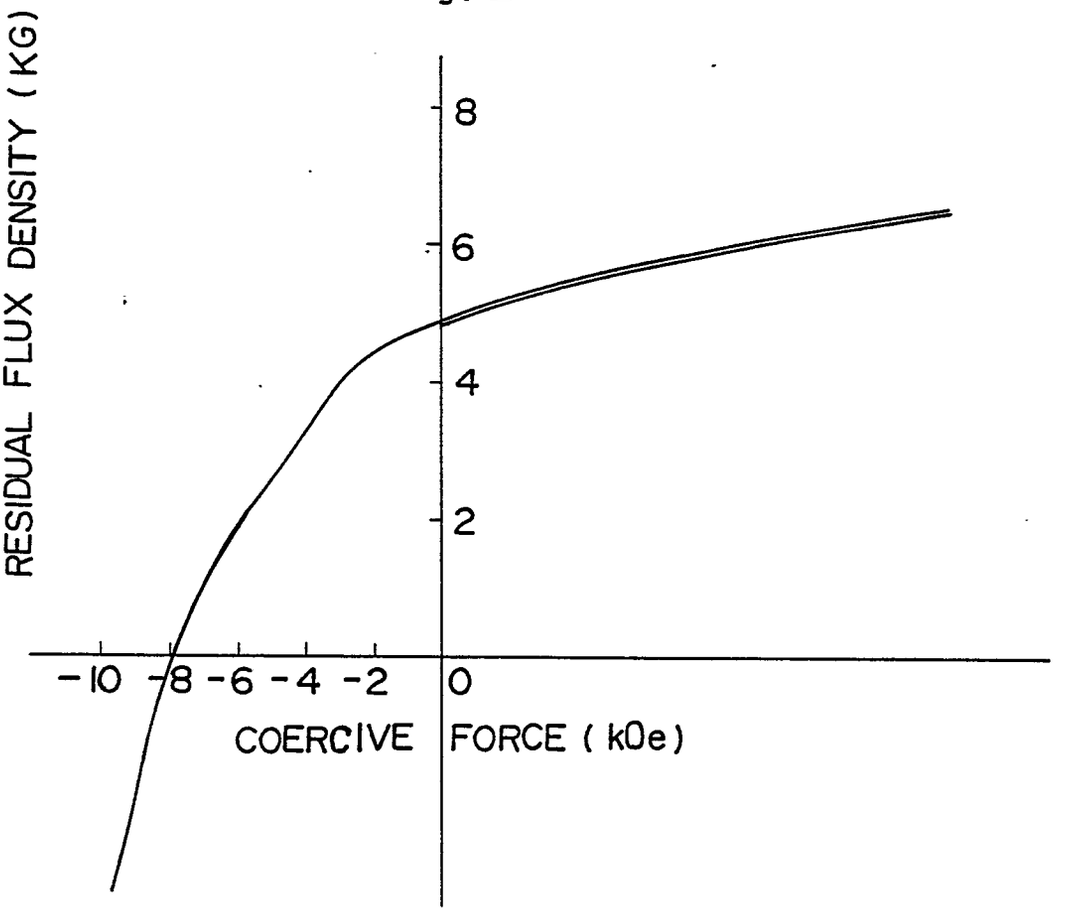
(1) Plastic magnets having the characteristics of a composite moulded pieces comprising Nd-Fe-B group alloys powder, ferrite magnet powder and phenol resin binding agent.

Fig. 1



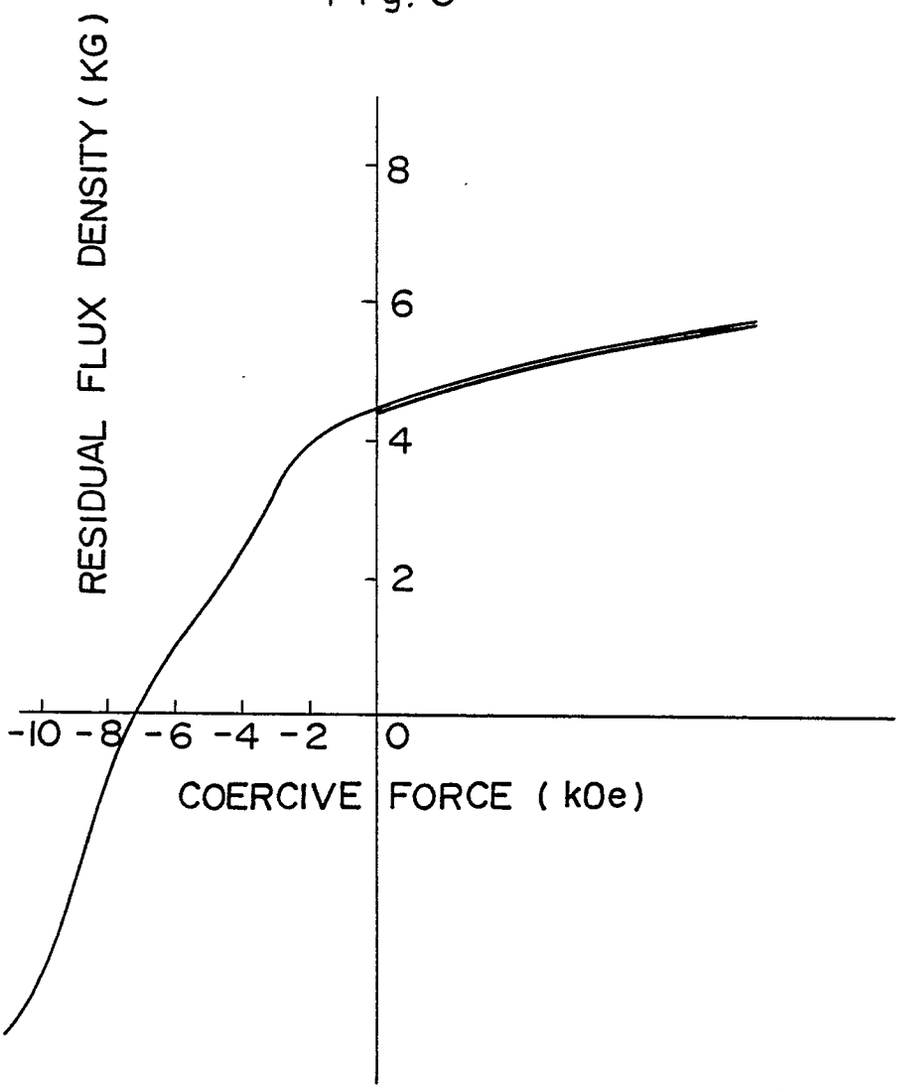
Br	:	B(H=0)	5.6693 KG
		BHmax	6.4763 MGOe
iHc	:	H(I=0)	-8.0877 kOe

Fig. 2



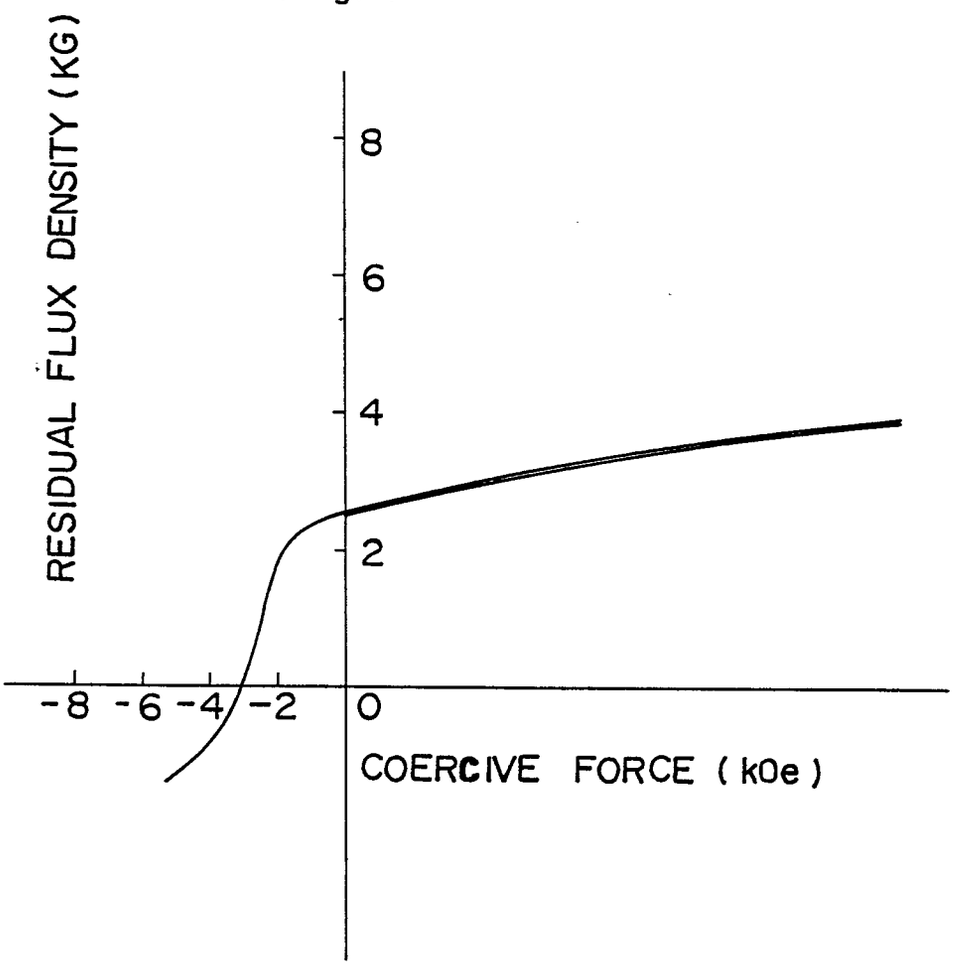
Br :	B(H=0)	4.8948	KG
	BHmax	4.9253	MGOe
iHc:	H(I=0)	- 7.7578	kOe

Fig. 3



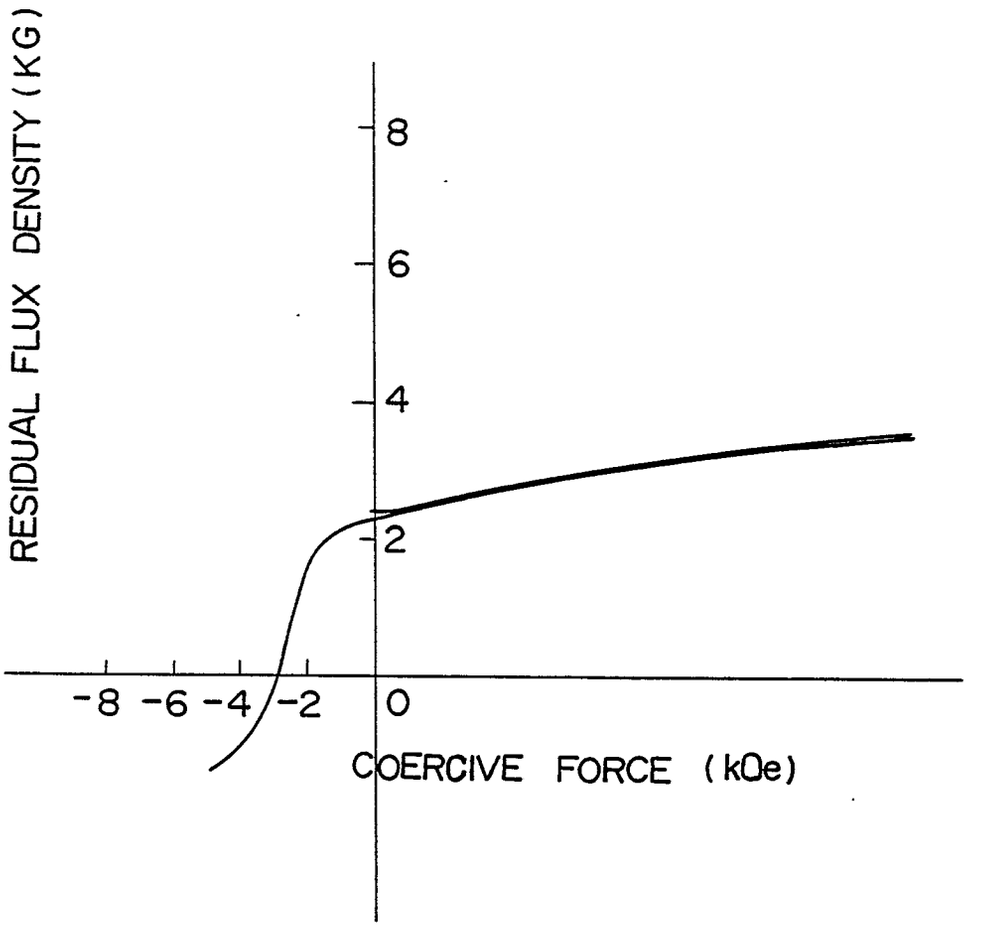
Br :	B(H=0)	4.5272	KG
	BHmax	4.0678	MGOe
iHc :	H(I=0)	- 7.0914	kOe

Fig.4



Br	:	B(H=0)	2.6045 KG
		BHmax	1.4136 MGOe
iHc	:	H(I=0)	- 3.1289 kOe

Fig. 5



Br :	B(H=0)	2.3568	KG
	BHmax	1.1891	MGOe
iHc :	H(I=0)	-2.9843	kOe

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 88107032.0

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl.4)
A	US - A - 4 308 155 (TADA) * Abstract * --	1	H 01 F 1/37
A	US - A - 4 022 701 (SAWA) * Abstract; claims 1-6 * --	1	
A	US - A - 4 184 972 (PEVZNER) * Abstract; claim 1 * --	1	
A	DE - A1 - 3 006 736 (INOUE-JAPAX) * Claims 1-9 * ----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

H 01 F 1/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	17-08-1988	VAKIL

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO Form 1503 03 82