amorphous alloy ribbon, so that each linear laser irradiation mark may intersect with the casting direction at an acute angle or at an obtuse angle.

[0114] In one embodiment of the present disclosure, it is preferable that each linear laser irradiation mark is approximately parallel to a direction that is orthogonal to the casting direction and a thickness direction of the Fe-based amorphous alloy ribbon.

[0115] What is meant by that each linear laser irradiation mark is approximately parallel to the direction that is orthogonal to the casting direction and the thickness direction of the Fe-based amorphous alloy ribbon is that each linear laser irradiation mark is arranged at an angle of 10 degrees or less relative to the direction orthogonal to the casting direction and the thickness direction of the Fe-based amorphous alloy ribbon.

[0116] Nevertheless, the positional relationship of the linear laser irradiation marks relative to one another is not limited to being approximately parallel.

[0117] In one embodiment of the present disclosure, it is preferable that each linear laser irradiation mark is approximately parallel to the width direction of the Fe-based amorphous alloy ribbon.

[0118] What is meant by that each linear laser irradiation mark is approximately parallel to the width direction of the Fe-based amorphous alloy ribbon is that each linear laser irradiation mark is arranged at an angle of 10 degrees or less relative to the width direction of the Fe-based amorphous alloy ribbon.

[0119] Nevertheless, the positional relationship of the linear laser irradiation marks relative to one another is not limited to being approximately parallel.

[0120] As mentioned above, each linear laser irradiation mark does not have to be parallel to the direction orthogonal to the casting direction of the Fe-based amorphous alloy ribbon, and may be arranged at an angle of inclination over 10 degrees relative to the direction orthogonal to the casting direction of the Fe-based amorphous alloy ribbon. It is to be construed that each linear laser irradiation mark is arranged along the direction orthogonal to the casting direction of the Fe-based amorphous alloy ribbon even if the angle of inclination is over 10 degrees. The angle of

[0182] Accordingly, it is particularly preferable that the Fe-based amorphous alloy ribbon of the present disclosure is used when the operating magnetic flux density Bmax satisfies that the Bmax/Bs ratio is 0.88 to 0.94 (preferably 0.89 to 0.92).

[0183] The Fe-based amorphous alloy ribbon of the present disclosure can inhibit increases in the iron loss and the exciting power even when the operating magnetic flux density Bmax satisfies that the Bmax/Bs ratio is 0.88 to 0.94 (preferably 0.89 to 0.92).

[0184] The aforementioned characteristics (iron loss CL, exciting power VA, coercive force Hc) are expressed in values obtained by heat-treating the Fe-based amorphous alloy ribbon by applying a magnetic field in the longitudinal direction of the ribbon. The magnetic field heat treatment of the Fe-based amorphous alloy ribbon aims to relax the internal stress and facilitate magnetic alignment in the longitudinal direction of the ribbon, and is appropriately performed to obtain the desired characteristics. The heat treatment can be performed by holding the ribbon for a certain period of time at about 300~~℃~~ degrees Celsius to 400~~℃~~ degrees Celsius. The holding time is preferably in twenty-four hours, and more preferably in four hours. The magnetic field during the heat treatment is preferably 400 A/m or more, and more preferably 800 A/m or more. The heat treatment can be also performed in the atmosphere, in an inert gas such as argon gas, nitrogen gas, and helium, or in a vacuum. The heat treatment can be also performed after formation of the iron core.

[0185] It is preferable that the Fe-based amorphous alloy ribbon of the present disclosure has excellent characteristics after formation of the linear laser irradiation mark and before the heat treatment.

[0186] For example, it is preferable that the coercive force Hc of a DC B-H loop measured at the maximum applied magnetic field of 800 A/m is 5.0 A/m or less before the heat treatment. The coercive force Hc is preferably 4.9 A/m or less, and more preferably 4.8 A/m or less. It is also preferable that the square ratio

calculated by the following Formula 1, Formula 2, and Formula 3, respectively. The measurement results are shown in Table 10.

[0320] [Comparative Example 2]

An iron core produced for Comparative Example 2 in the same manner as described above except that a ribbon piece in which no linear laser irradiation marks were formed was used was subjected to the same measurement and evaluation.

[0321] Formula 1: voltage E (V) = $4.443\ LF \times C \times W \times N_1 \times f \times Bm \times 10^{-6}$

Formula 2: exciting power (VA/kg) = $E \times I/M$

Formula 3: iron loss (W/kg) = Watt/M

The details of symbols in Formula 1 to Formula 3 are as follows.

[0322] E: effective voltage (V) measured by power meter

LF: lamination factor (=0.88)

C: core lamination thickness (mm)

W: nominal width (mm) of ribbon used

N_1: number of windings of excitation coil

f: frequency (Hz) measured

Bm: maximum magnetic flux density or prescribed magnetic flux density

I: effective current (A) measured by power meter

M: core weight (kg)

Watt: power (W) measured by power meter

[0323] [Table 9]

[0324] [Table 10]

[0325] As shown in Tables 9 and 10, the iron loss CL measured at 1.45 T and 60 Hz in the iron core using the ribbon piece in which no linear laser irradiation marks were formed was 0.284 W/kg, and the iron core using the ribbon piece in which the linear laser irradiation marks of the present embodiment were formed

【Table 8】

NO	LINE INTERVAL LP1 (mm)	SCANNING SPEED (m/sec)	LASER OUTPUT ENERGY DENSITY (J/m)	HEIGHT DIFFERENCE HL (μm)	LINE WIDTH ~~WL~~WA (μm)	HEIGHT DIFFERENCE × LINE WIDTH [HLx~~WL~~WA] (μm^2)	IRON LOSS CL (W/kg) at 1kHz,1T	EXCITING POWER VA (VA/kg) at 1kHz,1T
*1	-	-	0	0	0	0	8.7106	8.8922
16	20	10	8	0.46	41.20	18.95	6.9020	7.0383
23	20	10	12	0.55	45.65	25.11	6.8951	7.0373
27	20	10	15	0.60	49.19	29.51	6.2123	6.3724
31	20	10	18	0.76	52.52	39.92	6.1492	6.3858
35	20	10	21	1.18	67.98	80.22	5.7927	6.1326
38	20	10	25	1.34	73.65	98.69	5.6568	6.1730
40	20	10	28	1.21	81.44	98.54	5.5828	6.3395