and the sticking resistance, the punching quality, and the shear bond strength at 180° C. were evaluated. The results are shown in Table 6. The measurement and evaluation methods are as follows.

[0065] (Martens Hardness)

[0066] The Martens hardness of the surface of the bond-type insulating coating was measured using ultra-microhardness meter HM2000 made by FISCHER. A diamond-made Vickers indenter of a quadrangular pyramid having an angle between the opposite faces of 136° was used for measurement at room temperature (25° C.), and the Martens hardness was calculated from the slope of the load-recess depth curve.

[0067] (Logarithmic Decrement Peak Temperature)

[0068] The logarithmic decrement peak temperature was measured using rigid body pendulum-type physical property tester RPT-3000W made by A&D Company, Limited, according to ISO 12013-1 and 12013-2. The heating rate during the measurement was 12.5° C./min. The edge of the pendulum was a knife edge.

[0069] (Sticking Resistance)

[0070] Each electrical steel sheet for stacking obtained as a result of the baking step was sheared to 50 mm×50 mm, and five steel sheets were stacked to form a sticking resistance evaluation sample. The sample was subjected to heating and pressing treatment of 4.90 MPa (=50 kgf/cm^2) and 50° C. for 24 hours in the atmosphere and then cooled. After this, the peelability of the steel sheets was evaluated. The evaluation was performed by dropping a weight of 100 g from a height of 5 cm onto the five steel sheets stacked together (drop test) and determining whether or not the steel sheets peeled. The criteria are as follows.

(Criteria)

[0071] Good: peeling observed when the test piece was removed from the heating and pressing jig

[0072] Fair: peeled as a result of drop test

[0073] Poor: not peeled as a result of drop test

[0074] (Punching Quality)

[0075] Each electrical steel sheet for stacking was repeatedly punched using a 15 mmϕ steel die. The punching quality of the electrical steel sheet for stacking was evaluated based on the number of times punching was performed until the burr height reached 50 μm. The criteria are as follows.

(Criteria)

[0076] Excellent: 1200000 times or more

[0077] Good: 1000000 times or more and less than 1200000 times

[0078] Fair: 700000 times or more and less than 1000000 times

[0079] Poor: 300000 times or more and less than 700000 times

[0080] Very poor: less than 300000 times

[0081] (Shear Bond Strength at 180° C.)

[0082] Each shear tensile test piece was made according to JIS K6850-1999, and subjected to a tensile test. Two electrical steel sheets for stacking (25 mm in width×100 mm in length) obtained as a result of the baking step were stacked in the state of being displaced so that their insulating coatings bonded to each other in the part of 10 mm from the end (lap part: 25 mm in width×10 mm), and subjected to heating and pressing treatment under the conditions of 200° C. in temperature, 1.96 MPa (=20 kgf/cm^2) in pressure, and 1 hour in treatment time, to produce the test piece. Setting the tensile test environment to 180° C., the test piece was held at this temperature for 10 minutes, and then the test was conducted while maintaining the temperature. The test rate was 3 mm/min. The measured tensile strength was determined based on the following criteria.

(Criteria)

[0083] Excellent: 3.92 MPa or more

[0084] Good: 2.94 MPa or more and less than 3.92 MPa

[0085] Fair: 1.96 MPa or more and less than 2.94 MPa

[0086] Poor: 0.98 MPa or more and less than 1.96 MPa

[0087] Very poor: less than 0.98 MPa

[0088] Next, a plurality of electrical steel sheets for stacking obtained as a result of the baking step were stacked and subjected to heating and pressing treatment, to produce a stacked electrical steel sheet. The conditions of the heating and pressing treatment were 200° C. in heating temperature, 1.96 MPa (=20 kgf/cm^2) in pressure, and 1 hour in treatment time. The number of steel sheets stacked is shown in Table 1. Further, a plurality of stacked electrical steel sheets were stacked and fixed together through their bond-type insulating coatings, to produce an iron core. The conditions of the fixing were 200° C. in heating temperature, 1.96 MPa (=20 kgf/cm^2) in pressure, and 1 hour in treatment time. The number of stacked electrical steel sheets stacked is shown in Table 1.

[0089] For each of the obtained stacked electrical steel sheets, the high-temperature oil resistance was evaluated. The results are shown in Table 6. The evaluation method is as follows.

[0090] (High-Temperature Oil Resistance)

[0091] The stacked electrical steel sheet was immersed in oil held at 180° C., for 500 hours. The stacked electrical steel sheet was then removed and allowed to cool, and whether or not the stacked electrical steel sheet separated or peeled was observed. As the oil, Daphne Super Hydro 46HF made by Idemitsu Kosan Co., Ltd. was used. The criteria are as follows.

(Criteria)

[0092] Excellent: neither separated nor peeled

[0093] Good: not separated but locally peeled

[0094] Poor: separated into two or more parts

[0095] As shown in Table 6, each sample having the coating with Martens hardness of 50 or more and less than 500 had good sticking resistance and also was favorable in shear bond strength at 180° C., high-temperature oil resistance, and punching quality, regardless of the components of the bond-type insulating coating used. In particular, each sample with a logarithmic decrement peak temperature of 50° C. or more and 200° C. or less had better shear bond strength at 180° C. Moreover, each iron core produced using the stacked electrical steel sheets satisfying the conditions according to the disclosure had sufficiently favorable properties as an iron core for an automotive motor.