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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte SATOSHI KANO,
TAKEAKI WAKISAKA, and ICHIRO TANAKA

Appeal 2021-004640
Application 15/541,932
Technology Center 1700

Before JAMES C. HOUSEL, N. WHITNEY WILSON, and
JENNIFER R. GUPTA, *Administrative Patent Judges*.

GUPTA, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Pursuant to 35 U.S.C. § 134(a), Appellant² appeals from the
Examiner’s decision to reject claims 1 and 6–10.³ We have jurisdiction

¹ In this Decision, we refer to the Specification filed July 6, 2017 (“Spec.”); the Final Office Action dated December 15, 2020 (“Final Act.”); the Appeal Brief filed April 22, 2021 (“Appeal Br.”); the Examiner’s Answer dated May 24, 2021 (“Ans.”); and Reply Brief filed July 23, 2021.

² Appellant refers to “applicant” as defined in 37 C.F.R. § 1.42 (2020). Appellant identifies the real party in interest as Nippon Steel Corporation. Appeal Br. 1.

³ Claims 2 and 3 are withdrawn from consideration by the Examiner as drawn to a nonelected invention. Non-Final Office Action dated October 22, 2019. Claims 4 and 5 were canceled in an Amendment filed June 15, 2020.

under 35 U.S.C. § 6(b). A video hearing was held on December 16, 2021.⁴
We REVERSE.

CLAIMED SUBJECT MATTER

The claims are directed to a non-oriented electrical steel sheet. Spec.

¶ 1. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A non-oriented electrical steel sheet having a chemical composition comprising:

C: 0 to 0.0050 mass%,

Si: 0.50 to 2.70 mass%,

Mn: 0.10 to 3.00 mass%,

Al: 2.35 to 2.70 mass%,

P: 0.050 to 0.100 mass%,

S: 0 to 0.0060 mass%,

N: 0 to 0.0050 mass%,

Ti: 0 to 0.008 mass%,

V: 0 to 0.008 mass%,

Nb: 0 to 0.008 mass%,

Zr: 0 to 0.008 mass%, and

a balance: Fe and impurities, wherein

the chemical composition satisfies a following expression (1), a following expression (2), and a following expression (3), an intensity of a {100} plane $I_{\{100\}}$ and an intensity of a {111} plane $I_{\{111\}}$ satisfy a following expression (4), the intensity

⁴ The record will include a transcript of the hearing when it becomes available.

$I\{100\}$ and the intensity $I\{111\}$ being determined by calculating an average of an orientation determination function near a surface and an orientation determination function at a thickness center using pole figures measured by an X-ray diffraction method,

a specific resistance is $60.0 \times 10^{-8} \Omega \cdot \text{m}$ or higher at room temperature,

a thickness is 0.05 mm to 0.40 mm,

$$0.50 \leq \text{Al}/(\text{Si} + \text{Al} + 0.5 \times \text{Mn}) \leq 0.83 \quad (1)$$

$$1.28 \leq \text{Si} + \text{Al}/2 + \text{Mn}/4 + 5 \times \text{P} \leq 3.90 \quad (2),$$

$$4.0 \leq \text{Si} + \text{Al} + 0.5 \times \text{Mn} \leq 7.0 \quad (3), \text{ and}$$

$$0.50 \leq I\{100\}/I\{111\} \leq 1.18 \quad (4),$$

wherein in expressions (1) to (3) the chemical symbols indicate the amounts of the corresponding chemical elements in mass%.

Appeal Br. 14–15 (Claims App.).

REJECTION

On appeal, the Examiner maintains the rejection of claims 1 and 6–10⁵ under 35 U.S.C. 103 as unpatentable over Miyazaki⁶ in view of Fujita '948.⁷ Ans. 3.

⁵ As noted above, claims 4 and 5 were canceled. *See supra* note 3.

⁶ Miyazaki et al., US 2012/0014828 A1, published Jan. 19, 2012.

⁷ Fujita et al., JP 2001-158948A, published June 12, 2001. We refer to the machine translation of record of Fujita '948 as cited by the Examiner. *See generally* Final Act.

DISCUSSION

The Examiner finds, and Appellant does not dispute that Miyazaki teaches a non-oriented electrical steel sheet having a chemical composition that includes chemical elements that overlap or fully encompass the ranges recited in claim 1. *Compare* Final Act. 2–3 (citing Miyazaki ¶¶ 1, 13, 29, 69, 70), with Appeal Br. *generally*; *see also* tables provided by the Examiner at pages 2–3 of the Final Action, reproduced below.

Component	Present Invention	Miyazaki
C	0 to 0.0050	0.01 or less [0023]
Si	0.50 to 2.70	1.0 to 3.5 [0023]
Mn	0.10 to 3.00	0.1 to 2.0 [0023]
Al	2.35 to 2.70	0.1 to 3.0 [0023]
P	0.050 to 0.100	0.1 or less [0023]

Component	Present Invention	Miyazaki
S	0 to 0.0060	0.005 or less [0023]
N	0 to 0.0050	0.005 or less [0023]
Ti	0 to 0.008	0.0005 to 0.02 [0023]
V	0 to 0.008	0.01 or less [0070]
Zr	0 to 0.008	0.01 or less [0069]
Fe and impurities	Balance	Balance [0023]
Formula (1)	0.5 to 0.83	0.02 to 0.74 (calculated)
Formula (2)	1.28 to 3.90	1.075 to 6.0 (calculated)
Formula (3)	4.0 to 7.0	1.15 to 7.5 (calculated)

The tables reproduced above compare the amount, in mass%, of chemical elements in the chemical composition of Miyazaki's non-oriented

steel sheet with the chemical elements in the chemical composition of claim 1's non-oriented steel sheet.

The Examiner acknowledges that Miyazaki is silent on numerical values of specific electrical resistance and is silent on measurements of intensity of a $\{100\}$ plane $I\{100\}$ and an intensity of a $\{111\}$ plane $I\{111\}$ at center thickness. Final Act. 3. To account for this difference, the Examiner relies on Fujita '948.

The Examiner finds that Fujita '948 teaches that $I\{100\}/I\{111\}$ at $\frac{1}{4}$ thickness is ≥ 1.20 , which approaches the range of 0.50 to 1.18 recited in claim 1. Final Act. 4–5 (citing Fujita '948 ¶¶ 9, 20). As explained in the Answer, the Examiner's position is that

non-oriented steels of the claimed composition and intensity ratio of 1.20, such as those resulting from the combination of Miyazaki and Fujita '948 as applied, would be sufficiently close to the claimed non-oriented steel sheet that one of ordinary skill in the art would expect such non-oriented steels of the claimed composition and intensity ratio of 1.20 to have the same properties as those with an intensity ratio of 1.18.

Ans. 9.

Appellant argues that neither Miyazaki nor Fujita '948 teaches or suggests a non-oriented electrical steel sheet where the intensity of $I\{100\}/I\{111\}$ is greater than or equal to 0.50 and less than or equal to 1.18. Appeal Br. 5; Reply Br. 2.

Appellant's argument is persuasive of reversible error. As the Examiner acknowledges, Fujita '948's intensity ratio is close, but does not fall within the range of 0.50 to 1.18 recited in claim 1. Final Act. 4. As the Specification explains, and Appellant argues, in addition to the makeup of the steel composition, to control $I\{100\}/I\{111\}$, "it is necessary to keep the

temperature of the cold band at a constant temperature in a range of 550°C to 700°C for 10 to 300 s.” Spec. ¶ 53. In other words, it is the chemical composition as well as the process of making Appellant’s non-oriented electrical steel sheet that affects the intensity of $I\{100\}/I\{111\}$. Miyazaki teaches that the cold-rolled sheets were subjected to a finish annealing at 950°C. Miyazaki ¶ 86. Fujita ’948 teaches that its steel was held at a temperature of 860°C or more in a final annealing step. Fujita ’948 ¶ 57 (Table 5). The Examiner, however, has not identified sufficient evidence that Miyazaki or Fujita ’948 teach or suggest an intermediate holding in a range of 550°C to 700°C for 10 to 300 seconds during the heating stage of the final annealing step. Thus, one of ordinary skill in the art would not have expected the non-oriented steel resulting from the combination of Miyazaki and Fujita ’948 to have an intensity of a $\{100\}$ plane $I\{100\}$ and an intensity of a $\{111\}$ plane $I\{111\}$ that falls within the range recited in claim 1, i.e., $0.5 \leq I\{100\}/I\{111\} \leq 1.18$. Accordingly, we do not sustain the rejection of claims 1 and 6–10.

CONCLUSION

The Examiner’s decision to reject claims 1 and 6–10 is reversed.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 6–10	103	Miyazaki, Fujita ’948		1, 6–10

REVERSED