Appeal decision

Appeal No. 2018-4162

Appellant NuCurrent, Inc.

Patent Attorney KAICHI IP Patent Attorneys

The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2013-47049, entitled "HIGHLY EFFICIENT MULTILAYER MULTIWINDING STRUCTURE FOR RADIO COMMUNICATION" (the application published on September 22, 2014, Japanese Unexamined Patent Application Publication No. 2014-175865) has resulted in the following appeal decision.

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

This application was filed on March 8, 2013, and the history of the procedures is as follows.

May 8, 2013:	Submission of written submission of translation
as of January 24, 2017:	Notification of reasons for refusal
June 27, 2017:	Submission of written opinion and written amendment
as of November 21, 2017:	Examiner's decision of refusal
March 27, 2018:	Submission of written appeal and written amendment

No. 2 Decision to dismiss amendment on the written amendment submitted on March 27, 2018

[Conclusion of Decision to Dismiss Amendment]

The amendment dated on March 27, 2018 (hereinafter referred to as "Amendment") shall be dismissed.

[Reason]

1 Regarding the Amendment (Detail of Amendment)

(1) Description of the claims after Amendment

Amendment amended the description of Claim 1 of the scope of claims as follows. (Amended portions are underlined.)

"A structure for radio communication having wire structure characterized by comprising:

a plurality of conductors;

an insulator arranged to separate the multiple conductors, and to constitute a wire structure with the conductors, and having a thickness of 200 μm or less; and

at least one connector for connecting two or more conductors,

wherein the at least two conductors are electrically connected by at least one of parallel connection, series connection, and a combination of parallel connection and series connection, and

the wire structure is configured to propagate electric signals though at least one of the conductors at one frequency."

(2) Description of the claims before Amendment

Claim 1 of the scope of claims amended by the written amendment submitted on June 27, 2017 is as follows.

"A structure for radio communication having wire structure comprising:

a plurality of conductors;

an insulator for separating the conductors; and

at least one connector for connecting two or more conductors,

wherein the conductors and the insulator are arranged so as to form one wire structure, and

the at least two conductors are electrically connected by at least one of parallel connection, series connection, and a combinational connection of parallel and series connections, and

the wire structure is configured to transmit electric signals through at least one of the conductors at one frequency."

2 Propriety of amendment

Amendment is to restrict the scope of claims by amending the configuration before Amendment "an insulator for separating the conductors" to the configuration after Amendment "an insulator arranged to separate the multiple conductors, and to constitute a wire structure with the conductors, and having a thickness of 200 μm or less", and to clarify the ambiguous statements by amending the configuration before Amendment "transmit electric signals" to the configuration after Amendment "propagate electric signals" and so forth. The invention described in Claim 1 before Amendment and the invention described in Claim 1 after Amendment belong to the same industrial field and aim to solve the same problems. Thus, Amendment falls under the restriction of the scope of claims stipulated in Article 17-2(5)(ii) of the Patent Act.

We will examine below whether the invention according to Claim 1 after Amendment (hereinafter referred to as "Amended Invention") falls under the provisions of Article 126(7) of the Patent Act which is applied mutatis mutandis in the provisions of Article 17-2(6) of the Patent Act (whether it is independently patentable at the time of filing of the patent application).

(1) Amended Invention

Amended Invention is as described in 1 (1).

(2) Cited Invention and well-known art

A Cited Document

(A) U.S. Patent Application Publication No. 2012/0095531 Specification (hereinafter referred to as "Cited Document"), which was cited in the reasons for refusal of the

examiner's decision and distributed or made publicly available through an electric telecommunication line before the filing of the patent application, includes the following descriptions together with drawings.

a "[0012] The transmitting unit may include a transmitting antenna circuit having a first resonant frequency and a high quality factor. The transmitting antenna circuit may generate an electromagnetic field for wireless transfer of power and periodically generate a modulated time-varying signal for the transfer of data. The transmitting antenna circuit may have a quality factor greater than 100. Preferably, the quality factor is greater than 350. Most preferably, the quality factor is greater than 600. It is understood that traditional inductively coupled systems utilize antennas with a quality factor around 30.

[0013] The receiving unit is wirelessly coupled to the transmitting unit. The receiving unit may include a receiving antenna circuit having a second resonant frequency and a high quality factor. The second resonant frequency may be substantially equal to the first resonant frequency. The receiving antenna circuit may detect the electromagnetic field generated by the transmitting unit, generate an induced electric current, and detect the modulated time-varying signal periodically generated by the transmitting unit. The receiving antenna circuit may have a quality factor greater than 100. The receiving unit may also include a pickup antenna circuit inductively coupled to the receiving antenna circuit."

b "[0056] When a receiving unit 14 (e.g., receiving unit 14b) is placed within the near-field of the transmitting unit 12 (e.g., transmitting unit 12a) and both the receiving unit 14b and the transmitting unit 12a resonate at the same frequency and have antennas having high quality factors, energy will efficiently transfer from the transmitting unit 12a to the receiving unit 14b. It is understood that if additional receiving units 14c-14d are placed in the near-field, the additional receiving units 14c-14d will also resonate at the same frequency and draw energy from the transmitting unit 12a in the form of an induced alternating current. The receiving units 14a-14d may include a transducer which may use the induced alternating current to store energy in a power storage device, such as battery or capacitor. Alternatively, the transducer may use induced alternating current to directly power electronic components within the receiving unit 14."

c "[0081] The resonator component 122 includes a resonant structure, such as an antenna, and a tuning circuit. The resonant structure produces electromagnetic fields that may be used to wirelessly transfer power and/or control information from the internal controller 104 to the internal stimulator 106. The resonant structure may be used to convert the current received from the feed component 116 into electromagnetic fields to convey power and control information to the internal stimulator 106." (page 7, left column, lines 51 to 59)

d "[0091] The internal stimulator communications processor 138 may contain signal modulation and demodulation circuitry and connections to the load component 140 and the pickup component 132. The internal stimulator communications processor 138 may be used to recover any control information received by the resonator component 130 during a data transmission session. The recovered control information may be stored in memory within the internal stimulator communications processor 138 or in memory

coupled to the internal stimulator communications processor 138." (page 8, right column, lines 10 to 19)

e "[0123] As described above, the cross-sectional shape of the wire that is used to form the resonant component 122, 130 may be circular, square, rectangular, or triangular. Preferably, the wire has a relatively small diameter, or height relative to the width of the wire, and may be on the order of twice the skin-depth at the operating frequency. FIG. 13A-FIG. 13F illustrate cross-sections of wires that may be used in the design of the resonant component 122, 130. FIG. 13A illustrates a wire having a circular cross section 205. FIG. 13B illustrates a wire having a rectangular cross section in the form of a square 207. FIG. 13C illustrates a wire having a thin rectangular cross section 209. FIG. 13D illustrates a wire having an elliptical cross section 211. FIG. 13E illustrates a cross section of a litz wire 213. FIG. 13F illustrates a cross section of a copper tube 215. The wire may be copper, gold, silver-coated copper, silver-coated gold, or any other conductor.

[0124] It may be preferable to use a wire having a thin rectangular cross section, a wire having an elliptical cross section, a litz wire, or a copper tube for applications in which the frequency is greater than 100 kHz. For low volume application, it may be desirable to use a wire having a thin rectangular cross section, a wire having an elliptical cross section, or a litz wire.

[0125] The quality factor of the resonant component 122, 130 is based, in part, on the number of layers and the metal thickness and metal strip width of the wire in each layer. Each layer may be a single strip of metal having a metal thickness and metal strip width. FIG. 14A illustrates cross-section of a resonant component having a first layer 217 and a second layer 219. An insulating material 223 separates the first layer 217 from the second layer 219. The first layer 217 and second layer 219 are connected with vias 221 which traverse the insulating material 223. The metal thickness of the first layer 217 is identified by line A-A and the metal strip width of the first layer 219 is identified by line B-B. In one example, the metal thickness of a layer may be approximately twice the skin-depth. Each layer in a turn will have substantially the same metal thickness and metal strip width. A higher quality factor may be achieved using multiple layers for a single turn of coil. If additional layers are added to a turn of the coil, the additional layers include insulating material and are electrically connected to the other layers in that turn using vias through the insulating material. It is understood that by varying the number of turns, the metal thickness, and metal strip width, a higher quality factor may be achieved.

[0126] In one example, the resonant component 122, 130 may be a single turn coil having multiple layers, as illustrated in FIG. 14B. The single turn coil includes a single turn and may include a metal thickness of approximately 0.03 mm, a metal strip width of approximately 1.75 mm, and an outer radius of approximately 5 mm. The coil may have between 10 and 60 layers; however it is understood that the coil may have less than 10 or more than 60 layers in order to achieve a high quality factor. For example, for a five layer single turn coil having a metal thickness of 30 μm and a metal strip width of 1.75 mm, the quality factor at 27 MHz is approximately 242. By increasing the

number of layers from five to twenty and keeping a metal thickness of 30 μm and a metal strip width of 1.75 mm, the quality factor is increased to approximately 400. It is also understood that metal strip width may be increased to achieve a higher quality factor.

[0127] In another example, the resonant component 122, 130 may be coil having multiple turns and multiple layers, as illustrated in FIG. 14C. The coil may include two turns and may include a metal thickness of approximately 30 μm, a metal strip width of approximately 1.75 mm, and an outer coil radius of approximately 5 mm. Although the illustrated coil includes two turns, it is understood that the coil may include more than two turns. The coil preferably has between 10 and 60 layers; however, it is understood that the coil may have less than 10 or more than 60 layers in order to achieve a higher quality factor. For example, for a ten layer, two turn coil having a metal thickness of 30 μm and a metal strip width of 1.75 mm, the quality factor at 27 MHz is approximately 740. It is understood that metal strip width may be increased to achieve a higher quality factor.

[0128] It is also contemplated that other designs may be used for the resonator components 122, 130. For example, the designs shown in FIGS. 14B and 14C may be modified by using a thinner metal strip thickness, such as, for example, approximately 50 μM. The metal thickness may be approximately 30 μm and the outer coil radius may be approximately 5 mm. Preferably, the coil has 15 layers; however, it is understood that the coil may have more layers in order to achieve a high quality factor. It is also understood that the number of turns may be increased or decreased in order to achieve a high quality factor.

[0129] In order for the resonant component 122, 130 to be efficient at the operating frequency, it is preferred that the resonant component 122, 130 be resonant. The resonant component 122, 130 may be made resonant with the addition of a capacitor. The added capacitor may be a high quality factor capacitor. The rectifier and filter component 134, voltage regulator 136, internal stimulator communications processor 138, and load component 140 comprise electronics and active and passive circuits that are powered by the inductively coupled link between the resonant component 122 and the resonant component 130, as described above. In order to achieve maximum power transfer, it is preferred that the resonant component 130 be conjugate matched to the rectifier and filter component 134, voltage regulator 136, internal stimulator communications processor 138, and load component 140." (page 12, right column, line 10 to page 13, left column, line 49)

f "

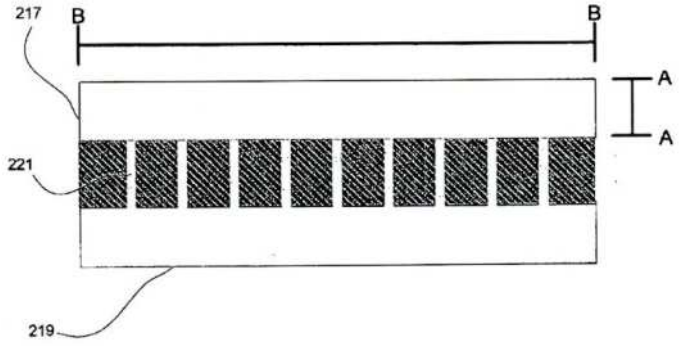


FIG. 14A

" (FIG. 14A)

(B) In light of the above descriptions, the "resonant component" is recognized as comprising the following configuration.

a As disclosed in [0123], since the resonant component 122, 130 is formed by using a wire having a predetermined cross section, it can be said that the resonant component 122, 130 has a wire structure. According to [0125], the cross section of the resonant component is disclosed in FIG. 14A, and the quality factor of the resonant component 122, 130 is based on a metal thickness and metal strip width of the wire. The metal thickness and metal strip width are represented by the line A-A and the line B-B in FIG. 14A, respectively. Thus, it can be said that the first layer 217 and the second layer 219 have a wire structure.

As is obvious from FIG. 14A and the description in [0125], the resonant component 122, 130 includes the first layer 217 and the second layer 219 formed as conductors including metal strips. The insulating layer 223 separates the first layer 217 from the second layer 219. The first layer 217 and the second layer 219 are connected electrically with vias 221 which traverse the insulating layer 223.

b According to [0129], the resonant component 122, 130 is powered at the operating frequency by the inductively coupled link between the resonant component 122 and the resonant component 130. According to [0081] and [0091], the resonant component transfers not only electric power but also "power and/or control information", specifically, converts the current (or electric signal) received from the feed component 116 into electromagnetic fields to be transferred wirelessly.

(C) In light of (A) and (B), Cited Document is recognized as describing the following invention (hereinafter referred to as "Cited Invention"),

"A resonant component with wire structure for transferring power and/or control information comprising:

a first layer 217 and a second layer 219;

an insulating layer 223 arranged to separate the first layer 217 from the second layer 219, and to constitute wire structure with the first layer 217 and the second layer 219; and

vias 221 for connecting the first layer 217 and the second layer 219,

wherein the first layer 217 and the second layer 219 are electrically connected to each other, and

the wire structure is configured to convert electric signals input to the first layer 217 and the second layer 219 into electromagnetic fields, at the operating frequency, to be propagated wirelessly."

B Well-known document

(A) The microfilm of Japanese Utility Model Application No. S47-147058 (Japanese Unexamined Utility Model Application Publication No. S49-101249)(hereinafter referred to as "Well-known document"), which was distributed or made publicly available through an electric telecommunication line before the filing of the patent application, includes the following descriptions together with drawings. (The underlines were added by the body.)

a "As described above, cross section is increased by stacking conductive bands , and increase in high-frequency resistance due to the skin effect is mitigated, thereby increasing Q." (p. 2 l. 5-l. 7)

b "First, FIGS. 1 to 3 are described below.

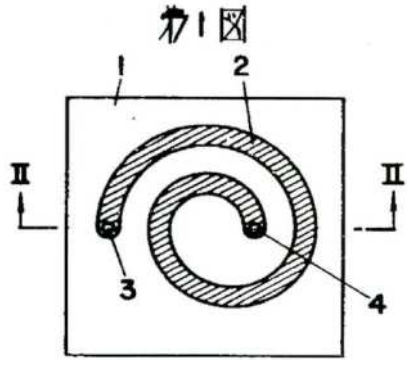
1 is a mica, porcelain, or appropriate insulating layer. 2 are spiral conductive bands arranged on both sides of the insulating layer 1 by appropriate means, such as printed wiring, vapor deposition, plating, or bonding. The conductive bands 2, 2 having the same shape are arranged in equal positions. When a plurality of insulating layers 1 are stacked, conductive bands on lower insulating layers and upper insulating layers are superposed sequentially. Both ends of the conductive bands 2, 2 on both sides of the insulating layers are connected to each other by conductive materials 3, 4 which penetrate through the insulating layers 1." (p. 2 l. 11-p. 3 l. 6)

c "If the thickness of the insulating layer 1 or 11 is equal to or less than 1/10 of the width of the conductive band 2 or 12, magnetic paths of currents flowing through the conductive bands in each layer are substantially the same. Therefore, reduction in inductance due to parallel connection can be ignored.

... (Omitted) ...

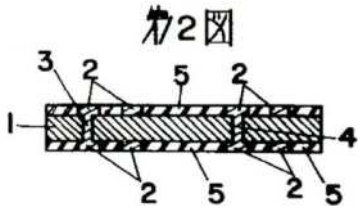
FIG. 5 shows a measurement result of an element which is formed by laminating mica layers having a thickness of 20 mμ (Note by the body: "mμ" is recognized as an error of "μm") with a one-turn spiral coil having an inner diameter of 7 mm and a conductive band width of 1.5 mm formed thereon by printing. This shows excellence of this device." (p. 4 l. 8-p. 5 l. 4)

d "



" (FIG. 1)

e "



" (FIG. 2)

(B) The "conductive band width" described in the above c is recognized as abbreviating the width of the conductive band, from the meanings of the words. In the Well-known document, in order to ignore reduction in inductance due to parallel connection, the thickness of the insulating layer is equal to or less than 1/10 of the width of the conductive band and in one embodiment, the width of the conductive band is 1.5 mm.

Thus, according to (A) and (B), the Well-known document discloses the following matter: "In a coil structure formed by arranging spiral conductive bands having the same turning direction and insulating layers alternately and by connecting both ends of the conductive bands of each layer, a range of thickness of the insulating layer is equal to or less than 1/10 of 1.5 mm, which is the width of the conductive band, thereby improving quality factor at a high frequency with reduced DC resistance while suppressing the skin effect at a high frequency" (hereinafter referred to as "Well-known art 1").

According to the above b to c and FIGS. 1 and 2, the Well-known document also discloses that the configuration of "connecting the conductive bands of each layer" is so-called "parallel connection" (hereinafter referred to as "Well-known art 2").

(3) Comparison

A Amended Invention and Cited Invention are compared.

a Regarding the insulator

The "insulating layer" in Cited Invention is formed of layered insulators. Thus, there is no difference between the "insulating layer" of the Cited Invention and the "insulator" in Amended Invention.

Therefore, the configuration of Amended Invention "an insulator for separating the multiple conductors, arranged to constitute a wire structure with the conductors, and having a thickness of 200 μm or less" and the configuration of Cited Invention "an insulating layer arranged to separate the first layer 217 from the second layer 219, and to constitute wire structure with the first layer 217 and the second layer 219" are identical in the point of "an insulator arranged to separate a plurality of conductors and to constitute a wire structure with the conductors", and they are different in that it is unclear whether or not the thickness of the insulating layer of Cited Invention is equal to or less than 200 μm.

b Regarding the connector

The "two or more conductors" in the configuration of Amended Invention "at least one connector for connecting two or more conductors" includes the configuration

of Cited Invention "two conductors". The "at least one" in Amended Invention includes "a plurality of" in Cited Invention.

The via in Cited Invention, which "connects" the first layer 217 and the second layer 219, is a kind of connector.

Therefore, the "vias for connecting the first layer 217 and the second layer 219" are included in the "at least one connector for connecting two or more conductors" in Amended Invention.

c Regarding electrical connection

The configuration of Amended Invention "at least two conductors are electrically connected by at least one of parallel connection, series connection, and a combination of parallel connection and series connection" and the configuration of Cited Invention "the first layer 217 and the second layer 219 are electrically connected to each other with vias" are identical with each other in a configuration where "at least two conductors are electrically connected to each other", and they are different in that it is unclear whether or not Cited Invention comprises the configuration, "electrically connected by at least one of parallel connection, series connection, and a combination of parallel connection and series connection".

d Regarding the configuration of propagating electric signals

Since the receiving unit and the transmitting unit resonate at the same frequency according to [0012], [0013], and [0056] in Cited Document, the "operating frequency" in Cited Invention is "one frequency". And the configuration of Cited Invention "convert electric signals input to the first layer 217 and the second layer 219 into electromagnetic fields to be propagated wirelessly" is included in the configuration of Amended Invention "propagate electric signals though at least one of the conductors". Thus, the matter in Cited Invention "the wire structure is configured to convert electric signals input to the first layer 217 and the second layer 219 into electromagnetic fields, at the operating frequency, to be propagated wirelessly" is included in the matter in Amended Invention "the wire structure is configured to propagate electric signals though at least one of the conductors at one frequency".

e Regarding the structure

The "resonant component for transferring control information" in the matter in Cited Invention "resonant component with wire structure for transferring power and/or control information" is the same as the "structure for radio communication" in Amended Invention. Therefore, there is no difference between the above configuration in Cited Invention and the "structure for radio communication having wire structure" in the Amended Invention.

B In light of the above, the corresponding features and different feature between Amended Invention and Cited Invention are as follows.

[Corresponding features]

"A structure for radio communication having wire structure comprising:

a plurality of conductors;

an insulator arranged to separate the multiple conductors, and to constitute a wire structure with the conductors; and

at least one connector for connecting the two conductors,
wherein the at least two conductors are electrically connected,
the wire structure is configured to propagate electric signals though at least one of the conductors at one frequency."

[Different features]
<Different Feature 1>
An "insulator" is described as "an insulator having a thickness of 200 μm or less" in Amended Invention, while being described as "an insulating layer" in Cited Invention.

<Different Feature 2>
An "electrical connection" is configured so that "at least two conductors are electrically connected by at least one of parallel connection, series connection, and a combination of parallel connection and series connection" in Amended Invention, while being merely configured so that "the first layer 217 and the second layer 219 are electrically connected to each other" in Cited Invention.

(4) Judgment
The different features are examined below.
A Regarding Different Feature 1
The Well-known art 1, which shows a conductive band having a width of 1.5 mm as an example, discloses that a range of thickness of an insulating layer is 150 μm or less. The width of the conductive band can be designed appropriately as necessary. Therefore, a person skilled in the art could have easily implemented an "insulator having a thickness of 200 μm or less" in Amended Invention by forming an insulator (insulating layer) of Cited Invention to have a thickness of, e.g., 200 μm, which includes the above well-known thickness.

B Regarding Different Feature 2
The configuration of Amended Invention, "at least one of parallel connection, series connection, and a combination of parallel connection and series connection" is a configuration of "parallel connection" or "series connection", or "a combination of parallel connection and series connection". A configuration of "parallel connection" is examined below.
Cited Invention separates the first layer 217 from the second layer 219 by an insulating layer, and electrically connects them with vias. According to the Well-known art 2, it can be said that the first layer 217 and the second layer 219 are connected by "parallel connection".
Thus, a person skilled in the art could have easily defined the configuration of Cited Invention, "the at least two conductors are electrically connected", as a configuration in which "the at least two conductors are electrically connected by parallel connection" as described in Amended Invention, based on Cited Invention and the Well-known art 2.

C Even if the above different features are comprehensively considered, working effects produced by Amended Invention are only within the range which can be predicted from working effects to be produced by Cited Invention and the well-known

art, and cannot be regarded as particularly distinguishing effects.

D Amended Invention could have been easily made by a person skilled in the art based on Cited Invention and well-known arts. Therefore, the appellant should not be granted a patent for it independently at the time of patent application under the provisions of Article 29(2) of the Patent Act.

3 Closing about Amendment

Since Amendment violates the provisions of Article 126(7) of the Patent Act which is applied mutatis mutandis pursuant to the provisions of Article 17-2(6) of the Patent Act, Amendment shall be dismissed under the provisions of Article 53(1) of the Patent Act applied mutatis mutandis by replacing certain terms pursuant to Article 159(1) of the Patent Act.

Thus, the decision as described in [Conclusion of Decision to Dismiss Amendment] has been made.

No. 3 Regarding the Invention

1 The Invention

Since amendment dated on March 27, 2018 was dismissed as above, the invention according to claims of the application is specified by the matters described in Claims 1 to 16 of the scope of claims amended by Amendment dated on June 27, 2017, and the invention according to Claim 1 (hereinafter referred to as "the Invention") is as described in the above No. 2 [Reason] 1 (2) specified by the matters described in Claim 1.

2 Reasons for refusal stated in the examiner's decision

The reasons for refusal stated in the examiner's decision are that since the invention according to Claim 1 of the application could have been easily made by a person who has ordinary skill in the art belonging to the invention before the filing of the application, based on the invention described in the following Cited Document which had been distributed before the filing of the application, the appellant should not be granted a patent for the invention under the provisions of Article 29(2) of the Patent Act.

(1) U.S. Patent Application Publication No. 2012/0095531 Specification

3 Cited Document

The matters described in the Cited Document cited in the reasons for refusal of the examiner's decision are as described in the above No. 2 [Reason] 2 (2).

4 Comparison and Judgment

Comparing the Invention with Cited Invention, the Invention is formed by omitting limitation related to Amendment from Amended Invention.

Therefore, since Amended Invention, which includes all of the matters specifying the invention of the Invention and includes other additional matters, could have been easily made by a person skilled in the art based on Cited Invention and the well-known arts, as described in the above No. 2 [Reason] 2 (3) and (4), the Invention could have also been easily made by a person skilled in the art based on the Cited

Invention and the well-known arts.

No. 4 Closing

As described above, the appellant should not be granted a patent for the Invention under the provisions of Article 29(2) of the Patent Act. Thus, this application should be rejected without examining inventions according to other claims.

Therefore, the appeal decision shall be made as described in the conclusion.

January 28, 2019

Chief administrative judge: YOSHIDA, Takayuki
Administrative judge: MIYASHITA, Makoto
Administrative judge: SATO, Minoru