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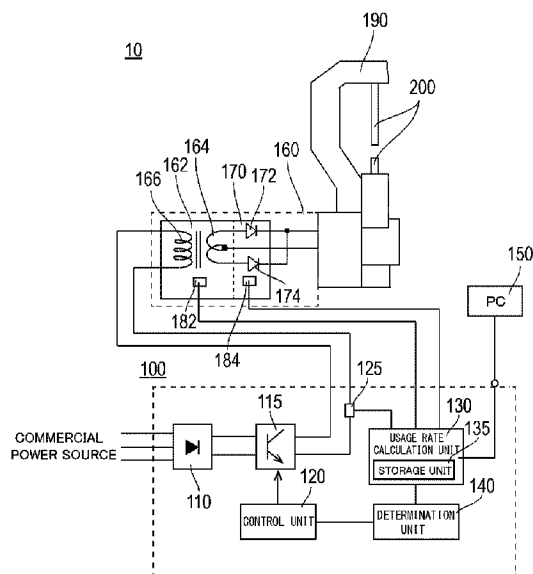
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(54) Titre : DISPOSITIF DE COMMANDE D'UNE SOUDEUSE PAR RESISTANCE
(54) Title: RESISTANCE WELDER CONTROLLER



(57) **Abrégé/Abstract:**

A resistance welder controller for controlling the operation of a resistance welder based on a welding current and a usage rate, the resistance welder controller comprising a control unit that controls a welding current flowing through an inverter, a current detection unit that detects the welding current flowing through the inverter, a usage rate calculation unit that, inter alia, calculates a usage rate of the inverter using an energizing time and a point time interval that have been measured, a storage unit that stores an equivalent current curve indicating a relationship between a current value of the welding current and the usage rate of the inverter when the inverter is operated at a rated capacity; and a determination unit that determines whether a relationship between the current value of the detected welding current and the calculated usage rate of the inverter exceeds the rated capacity of the inverter based on the equivalent current curve, wherein: when the rated capacity of the inverter is not exceeded, an operation of the control unit is continued; and when the rated capacity of the inverter is exceeded, the operation of the control unit is stopped.

ABSTRACT

A resistance welder controller for controlling the operation of a resistance welder based on a welding current and a usage rate, the resistance welder controller comprising a control unit that controls a welding current flowing through an inverter, a current detection unit that detects the welding current flowing through the inverter, a usage rate calculation unit that, inter alia, calculates a usage rate of the inverter using an energizing time and a point time interval that have been measured, a storage unit that stores an equivalent current curve indicating a relationship between a current value of the welding current and the usage rate of the inverter when the inverter is operated at a rated capacity; and a determination unit that determines whether a relationship between the current value of the detected welding current and the calculated usage rate of the inverter exceeds the rated capacity of the inverter based on the equivalent current curve, wherein: when the rated capacity of the inverter is not exceeded, an operation of the control unit is continued; and when the rated capacity of the inverter is exceeded, the operation of the control unit is stopped.

DESCRIPTION
RESISTANCE WELDER CONTROLLER

TECHNICAL FIELD

5 [0001]

The present invention relates to a resistance welder controller that controls operations of a resistance welder in consideration of a welding current and a usage rate of the resistance welder.

10

BACKGROUND ART

[0002]

In recent years, high tensile steel plates having higher tensile strength than conventional steel plates have been used for automobile bodies in order to secure strength and reduce weight. When high tensile steel plates are spot-welded, it is necessary to energize a larger welding current for a longer time than when the conventional steel plates are spot-welded. Consequently, an inverter-type resistance welder that can set a wide range of welding conditions and perform high-quality welding is used to spot-weld the high tensile steel plates. In general, the inverter-type resistance welder is not used being continuously energized. Thus, as shown in Patent Literature 1, the resistance welder is operated in consideration of a usage rate that is a ratio of time when the resistance welder can be energized within a fixed period of time.

30 Citation List

Patent Literature

[0003]

SUMMARY OF INVENTION

Technical Problem

5 [0004]

However, in spot-welding of high tensile steel plates in recent years, welding conditions such as a welding current, an energizing time, and a point time interval are varied at every welding point in order to achieve high quality welding at every welding point. Thus, when the resistance welder is operated in consideration of only the usage rate as in Patent Literature 1, the following problems occur.

[0005]

15 An inverter used in the inverter-type resistance welder may be used in excess of a rated capacity in spot-welding between high tensile steel plates. This adversely affects the life of the inverter. Since an electric capacity varies depending on the welding conditions to be used, it is difficult to manage the electric capacity so as not to exceed the rated capacity in consideration of only the usage rate.

[0006]

25 The present invention has been made in order to solve the above conventional problem. An object of the present invention is to provide a resistance welder controller that controls operations of a resistance welder in consideration of a welding current and a usage rate of the resistance welder.

30

Solution to Problem

[0007]

A resistance welder controller according to the present invention for achieving the above object includes a control unit that controls a welding current
5 flowing through an inverter, a current detection unit that detects the welding current flowing through the inverter, a usage rate calculation unit that measures an energizing time and a point time interval of the welding current that has been detected, and calculates a usage
10 rate of the inverter using the energizing time and the point time interval that have been measured, a storage unit that stores an equivalent current curve indicating a relationship between a current value of the welding current and the usage rate of the inverter when the
15 inverter is operated at a rated capacity, and a determination unit that determines whether a relationship between the current value of the detected welding current and the calculated usage rate of the inverter exceeds the rated capacity of the inverter
20 based on the equivalent current curve, continues an operation of the control unit when the relationship between the current value of the detected welding current and the calculated usage rate of the inverter does not exceed the rated capacity of the inverter, and
25 stops the operation of the control unit when the relationship between the current value of the detected welding current and the calculated usage rate of the inverter exceeds the rated capacity of the inverter.

[0007a] In an aspect there is provided a resistance welder controller for use with a resistance welder. The resistance welder controller comprises: a control unit that controls a welding current flowing through an inverter; a current detection unit that detects the welding current flowing through the inverter; a usage rate calculation unit that measures an energizing time and a point time interval of the welding current that has been detected, and activates a usage rate measurement mode or an average usage rate measurement mode and calculates a usage rate of the inverter using the energizing time and the point time interval that have been measured; a storage unit that stores an equivalent current curve indicating a relationship between a current value of the welding current and the usage rate of the inverter when the inverter is operated at a rated capacity; and a determination unit that determines whether a relationship between the current value of the detected welding current and the calculated usage rate of the inverter exceeds the rated capacity of the inverter based on the equivalent current curve, continues an operation of the control unit when the relationship between the current value of the detected welding current and the calculated usage rate of the inverter does not exceed the rated capacity of the inverter, and stops the operation of the control unit when the relationship between the current value of the detected welding current and the calculated usage rate of the inverter exceeds the rated capacity of the inverter.

Advantageous Effects of Invention

[0008]

According to the resistance welder controller of the present invention, an operation of the resistance welder is controlled in consideration of the welding current and the usage rate of the resistance welder, and thus the resistance welder can be operated within a range not exceeding the rated capacity of the resistance welder, and the life of the resistance welder can be extended.

BRIEF DESCRIPTION OF DRAWINGS

[0009]

Fig. 1 is a schematic configuration diagram of a resistance welder including a resistance welder controller of the embodiment.

Fig. 2 is an operation flowchart of the resistance welder controller of the embodiment in a usage rate measurement mode.

Fig. 3 is an operation flowchart of the resistance welder controller of the embodiment in an average usage rate measurement mode.

Fig. 4 is a diagram provided for explanation of an operation of the operation flowcharts of Figs. 2 and 3.

Fig. 5 is a diagram provided for explanation of the operation of the operation flowcharts of Figs. 2 and 3.

DESCRIPTION OF EMBODIMENT

[0010]

Hereinafter, an embodiment of a resistance welder controller according to the present invention will be described in detail with reference to the drawings. Fig.

1 is a schematic configuration diagram of a resistance welder including the resistance welder controller of the embodiment.

[0011]

5 <Configuration of resistance welder>

The resistance welder 10 includes an inverter 160 that supplies a welding current to electrodes 200 of a welding gun 190, and the resistance welder controller 100 that controls operations of the inverter 160.

10 [0012]

The inverter 160 is provided in a part of the welding gun 190, and supplies the welding current between the electrodes 200 of the welding gun 190. The inverter 160 has a transformer 162 that generates the welding current, and a diode stack 170 that rectifies the welding current generated by the transformer 162. The transformer 162 has a primary winding 166 and a secondary winding 164, and a current flowing through the primary winding 166 is amplified to a current corresponding to a winding ratio and supplied to the secondary winding 164. The diode stack 170 has diodes 172 and 174, and the diodes 172 and 174 convert an AC welding current flowing through the secondary winding 164 into a DC welding current. The welding current converted into the DC is supplied to a steel plate (not shown) pressured between the electrodes 200, and the steel plate is spot-welded by the electrodes 200.

[0013]

The inverter 160 is provided with a temperature detection unit that detects a temperature of the inverter 160. The temperature detection

unit has a transformer temperature detection unit 182 that detects a temperature of the transformer 162 that generates the welding current, and the rectifier temperature detection unit 184 that detects a temperature of the diode stack 170 as a rectifier that rectifies the welding current generated by the transformer 162.

[0014]

<Configuration of resistance welder controller>

10 The resistance welder controller 100 controls operations of the resistance welder 10 in consideration of the welding current and a usage rate of the resistance welder 10.

[0015]

15 The resistance welder controller 100 includes a rectification unit 110, a switching unit 115, a control unit 120, a current detection unit 125, a usage rate calculation unit 130, a storage unit 135, a determination unit 140, a PC 150 as an external computer, 20 the transformer temperature detection unit 182, and the rectifier temperature detection unit 184.

[0016]

The rectification unit 110 is connected to a three-phase commercial power source, converts, for example, 25 three-phase 50 Hz AC into DC, and supplies power to all components of the resistance welder controller 100. The switching unit 115 is switched by a switching signal output from the control unit 120, and outputs a voltage corresponding to welding conditions. The control unit 30 120 controls the welding current flowing through the inverter 160 by the switching signal output to the switching unit 115. The current detection unit

125 detects the welding current flowing through the inverter 160.

[0017]

The usage rate calculation unit 130 measures an energizing time and a point time interval of the welding current detected by the current detection unit 125. Further, the usage rate calculation unit 130 measures the temperature of the transformer 162 detected by the transformer temperature detection unit 182 and the temperature of the diode stack 170 detected by the rectifier temperature detection unit 184. Further, the usage rate calculation unit 130 calculates the usage rate of the inverter 160 using the energizing time and the point time interval that have been measured.

15 [0018]

The usage rate calculation unit 130 includes the storage unit 135 therein. The storage unit 135 stores an equivalent current curve indicating a relationship between a current value of the welding current when the inverter 160 is operated at a rated capacity and the usage rate of the inverter 160.

[0019]

The usage rate calculation unit 130 has two measurement modes of a "usage rate measurement mode" and an "average usage rate measurement mode" as measurement modes for calculating the usage rate. When the usage rate measurement mode is activated, the usage rate calculation unit 130 measures the energizing time and the point time interval of the welding current detected by the current detection unit 125 for each point, and calculates the usage rate of the inverter

160 using the measured energizing time and the point time interval. When the average usage rate measurement mode is activated, the usage rate calculation unit 130 measures the energizing time and the point time interval of the welding current detected by the current detection unit 125 for each of a plurality of points or for a fixed time. The usage rate calculation unit 130 calculates an average energizing time or an average point time interval for each of the plurality of points or for the fixed time that have been measured. Then, the usage rate calculation unit 130 calculates the usage rate of the inverter 160 using the average energizing time or average point time interval that have been calculated.

15 [0020]

The determination unit 140 determines whether the relationship between the current value of the welding current detected by the current detection unit 125 and the usage rate of the inverter 160 calculated by the usage rate calculation unit 130 exceeds the rated capacity of the inverter 160 based on the equivalent current curve stored in the storage unit 135. When the relationship between the current value of the detected welding current and the calculated usage rate of inverter 160 does not exceed the rated capacity of the inverter 160, the determination unit 140 continues an operation of the control unit 120. When the relationship between the current value of the detected welding current and the calculated usage rate of the inverter 160 exceeds the rated capacity of the inverter 160, the determination unit 140

stops the operation of the control unit 120.

[0021]

The determination unit 140 plots an intersection of the current value of the welding current detected by the current detection unit 125 and the usage rate of the inverter 160 calculated by the usage rate calculation unit 130 on a graph drawn using the equivalent current curve stored in the storage unit 135. When the plotted intersection is positioned below the equivalent current curve, the determination unit 140 determines that the relationship between the current value of the detected welding current and the calculated usage rate of the inverter 160 does not exceed the rated capacity of the inverter 160. When the plotted intersection is positioned above the equivalent current curve, the determination unit 140 determines that the relationship between the current value of the detected welding current and the calculated usage rate of the inverter 160 exceeds the rated capacity of the inverter 160.

[0022]

The equivalent current curve stored in the storage unit 135 is a curve obtained from experience on site or an experiment. In general, the equivalent current curve a is obtained by calculating the welding current $(KA) \times$ the usage rate $\alpha^{1/2}$. The usage rate is calculated by converting to an arbitrary current value. This is because, for example, when a welding process of an automobile is considered, it is necessary to consider the total usage rate of continuous points. The equivalent current curve (see Fig. 5) suggests that, in order to use the inverter 160 within a range

of the rated capacity, a large welding current can be passed when the usage rate is small, but only a small welding current can be obtained as the usage rate increases. The equivalent current curve varies depending on a size of the resistance welder 10 and a manner of welding. For every resistance welder 10, the equivalent current curve optimal for the resistance welder 10 is used.

[0023]

10 The PC 150 is connected to the usage rate calculation unit 130. The current value, the energizing time, and the point time interval of the welding current for each point detected by the current detection unit 125, and the usage rate of the inverter 160 calculated
15 by the usage rate calculation unit 130 are transmitted to the PC 150 as the external computer. The PC 150 stores and monitors the current value, the energizing time, and the point time interval of the welding current, and the usage rate of the inverter 160. Further, the
20 current value of the welding current detected by current detection unit 125 and the usage rate of inverter 160 calculated by usage rate calculation unit 130 are transmitted to the PC 150. The PC 150 plots the intersection of the current value of the detected
25 welding current and the calculated usage rate of the inverter 160 on the graph drawn using the equivalent current curve stored in the storage unit 135. The PC 150 monitors whether the relationship between the current value of the welding current and the usage rate
30 of the inverter 160 exceeds the rated capacity of the inverter 160. Further, the

temperature of the inverter 160 detected by the temperature detection unit is transmitted to the PC 150, and the temperature of the inverter 160 is stored and monitored by the PC 150.

5 [0024]

<Operation of resistance welder controller>

[Usage rate measurement mode]

Fig. 2 is an operation flowchart of the resistance welder controller 100 of the embodiment in the usage rate measurement mode. The operation in the usage rate measurement mode will be described with reference to Figs. 4 and 5.

[0025]

When the usage rate measurement mode is activated in the usage rate calculation unit 130, the usage rate calculation unit 130 first measures the current value of the welding current for each point, the energizing time of the welding current, and the point time interval of the welding current detected by the current detection unit 125 (S100). For example, as shown in Fig. 4, a current value A1 of the welding current at a first point, an energizing time T11 of the welding current at the first point, a point time interval T21 of the welding current at the first point, the current value A1 of the welding current at a second point, an energizing time T12 of the welding current at the second point, a point time interval T22 of the welding current at the second point, a current value A3 of the welding current at a third point, an energizing time T13 of the welding current at the third point, a point time interval T23 of the welding current of the third point, the current value A1 of the welding current of a fourth welding

point, an energizing time T14 of the welding current of the fourth point, and a point time interval T24 of the welding current of the fourth point are measured for each point.

5 [0026]

Next, the usage rate calculation unit 130 calculates the usage rate of the inverter 160 using the energizing time and the point time interval that have been measured in step S100 (S101). For example, in a case of Fig. 4, a usage rate α_1 of the inverter 160 at the first point can be obtained as $\alpha_1 = T_{11}/T_{21}$, a usage rate α_2 of the inverter 160 at the second point can be obtained as $\alpha_2 = T_{12}/T_{22}$, a usage rate α_3 of the inverter 160 at the third point can be obtained as $\alpha_3 =$
10 T_{13}/T_{23} , and a usage rate α_4 of the inverter 160 at the fourth point can be obtained as $\alpha_4 = T_{14}/T_{24}$.

[0027]

Next, the determination unit 140 determines whether a relationship between the current value of the welding current for each point measured in step S100 and the usage rate of the inverter 160 for each point calculated in step 101 exceeds the rated capacity of the inverter 160 based on the equivalent current curve stored in the storage unit 135. That is, it is determined whether the relationship between the welding current and the usage rate exceeds the rated capacity of the inverter 160 (S102).

[0028]

For example, as shown in Fig. 5, when the current value of the welding current at the first point is A1,

and the usage rate of the welding current at the first point is $\alpha 1$, the determination unit 140 plots an intersection of the current value A1 and the usage rate $\alpha 1$ on the graph drawn using the equivalent current curve a stored in the storage unit 135. When the plotted intersection is positioned below the equivalent current curve a, the determination unit 140 determines that a relationship between the current value A1 and the usage rate $\alpha 1$ does not exceed the rated capacity of the inverter 160 (S102: NO). When the relationship does not exceed the rated capacity, the determination unit 140 continues the operation of the control unit 120 and repeats the processing of steps S100 and S101.

[0029]

Meanwhile, for example, as shown in Fig. 5, when the current value of the welding current at the fourth point is A1, and the usage rate of the welding current at the fourth point is $\alpha 4$, the determination unit 140 plots an intersection of the current value A1 and the usage rate $\alpha 4$ on the graph drawn using the equivalent current curve a stored in the storage unit 135. When the plotted intersection is positioned above the equivalent current curve a, the determination unit 140 determines that a relationship between the current value A1 and the usage rate $\alpha 4$ exceeds the rated capacity of the inverter 160 (S102: YES). When the relationship exceeds the rated capacity, the determination unit 140 stops the operation of the control unit 120 and outputs an abnormality (S103). The abnormality is output for each point. For example, when it is determined that the relationship exceeds the rated

capacity at a completion of the third point, an abnormality is output before welding at the fourth point. When an abnormality is output, the resistance welder controller 100 demonstrates the abnormality with an alarm sound or a patrol light and outputs an abnormality signal to an external device such as the PC 150. The abnormality signal includes a contact signal and abnormal data, and the abnormal signal is output to the external device by wire or wirelessly. Note that when the abnormality is output, there is no recovering until the output is reset.

[0030]

As described above, when the usage rate measurement mode is activated, it is determined for each point whether the rated capacity of the inverter 160 is exceeded or not exceeded. The resistance welder 10 can be thus operated within a range not exceeding the rated capacity of the resistance welder 10, and the diodes 172 and 174 included in the inverter 160 can be protected from overheating. This can extend the life of the diode stack 170 and reduce a frequency of replacement of the diode stack 170. Further, considering that the replacement of the diode stack 170 takes a significant amount of time, production efficiency of a welding line can be improved.

[0031]

[Average usage rate measurement mode]

Fig. 3 is an operation flowchart of the resistance welder controller 100 of the embodiment in the average usage rate measurement mode. The operation in the average usage rate measurement mode will be described with reference to Figs. 4 and 5.

[0032]

When the average usage rate measurement mode is activated in the usage rate calculation unit 130, the usage rate calculation unit 130 first measures the current value of the welding current for each point, the energizing time of the welding current, and the point time interval of the welding current detected by the current detection unit 125 (S200). For example, as shown in Fig. 4, a current value A1 of the welding current at a first point, an energizing time T11 of the welding current at the first point, a point time interval T21 of the welding current at the first point, the current value A1 of the welding current at a second point, an energizing time T12 of the welding current at the second point, a point time interval T22 of the welding current at the second point, a current value A3 of the welding current at a third point, an energizing time T13 of the welding current at the third point, a point time interval T23 of the welding current of the third point, the current value A1 of the welding current of a fourth welding point, an energizing time T14 of the welding current of the fourth point, and a point time interval T24 of the welding current of the fourth point are measured for each point. The above measured data is temporarily stored in the storage unit.

[0033]

Next, the usage rate calculation unit 130 calculates the current value and the average usage rate of the average welding current at a fixed number of points or for a fixed time, using the energizing time and the point time interval measured in step S200 (S201). For example, when the fixed number of points is set to

four, in the case of Fig. 4, the current value of the average welding current is $(A1 \times 3 + A3)/4$, and the average usage rate is $(T11 + T12 + T13 + T14)/(T21 + T22 + T23 + T24)$. Note that the concept is the same in the case of the fixed time instead of the fixed number of points.

[0034]

Next, the determination unit 140 determines whether a relationship between the current value of the average welding current for each fixed number of points measured in step S201 and the average usage rate of the inverter 160 for each fixed number of points exceeds the rated capacity of the inverter 160 based on the equivalent current curve stored in the storage unit 135. That is, it is determined whether the relationship between the average welding current and the average usage rate exceeds the rated capacity of the inverter 160 (S202).

[0035]

For example, as shown in Fig. 5, when the current value and the average usage rate of the average welding current for the fixed number of points are $A5$ and $\alpha5$, respectively, the determination unit 140 plots an intersection of the current value $A5$ and the average usage rate $\alpha5$ on the graph drawn using the equivalent current curve a stored in the storage unit 135. When the plotted intersection is positioned below the equivalent current curve a , the determination unit 140 determines that a relationship between the current value $A5$ and the average usage rate $\alpha5$ does not exceed the rated capacity of the inverter 160 (S202: NO). When the relationship does not exceed the rated

capacity, the determination unit 140 continues the operation of the control unit 120 and repeats the processing of steps S200 and S201.

[0036]

5 Meanwhile, for example, as shown in Fig. 5, when the current value and the average usage rate of the average welding current for the fixed number of points are A6 and $\alpha 6$, respectively, the determination unit 140 plots an intersection of the current value A6 and the
10 average usage rate $\alpha 6$ on the graph drawn using the equivalent current curve a stored in the storage unit 135. When the plotted intersection is positioned above the equivalent current curve a, the determination unit 140 determines that a relationship between the current
15 value A6 and the average usage rate $\alpha 6$ exceeds the rated capacity of the inverter 160 (S202: YES). When the relationship exceeds the rated capacity, the determination unit 140 stops the operation of the control unit 120 and outputs an abnormality (S203). The
20 output of the abnormality is performed for each fixed number of points. For example, when it is determined that the relationship exceeds the rated capacity at a completion of the fixed number of points, the abnormality is output before welding at the next point.
25 The processing after the output of the abnormality is the same as in step S103.

[0037]

As described above, when the average usage rate measurement mode is activated, it is determined for each
30 fixed number of points whether the rated capacity of the inverter 160 is exceeded or not exceeded. The resistance welder 10 can be thus operated within a

range not exceeding the rated capacity of the resistance welder 10, and the diodes 172 and 174 included in the inverter 160 can be protected from overheating similarly to the usage rate measurement mode. This can extend the
5 life of the diode stack 170 and reduce a frequency of replacement of the diode stack 170. Further, considering that the replacement of the diode stack 170 takes a significant amount of time, production efficiency of a welding line can be improved.

10 [0038]

As described above, the resistance welder controller 100 of the embodiment can prevent a rectifier element such as the diodes 172 and 174 from deteriorating. This can prevent a situation where the
15 resistance welder 10 such as a welding robot suddenly stops due to the deterioration of the diodes 172 and 174 and the production line is forced to stop for a long time for a replacement of the diode stack 170 together with the inverter 160. Further, the life of the
20 inverter 160 can be extended and the diodes can be preventively maintained, and thus the diode stack 170 can be replaced as scheduled.

[0039]

Although the embodiment of the resistance welder
25 controller according to the present invention has been described above, the technical scope of the present invention is not limited to the description of the embodiment. What is not explicitly described in the embodiment but modified by those skilled in the art
30 within the scope of the claims is included in the technical scope of the present invention.

Reference Signs List

[0040]

- 10 Resistance welder
- 100 Resistance welder controller
- 5 110 Rectification unit
- 115 Switching unit
- 120 Control unit
- 125 Current detection unit
- 130 Usage rate calculation unit
- 10 135 Storage unit
- 140 Determination unit
- 150 PC (external computer)
- 160 Inverter
- 162 Transformer
- 15 164 Secondary winding
- 166 Primary winding
- 170 Diode stack
- 172, 174 Diode (rectifier)
- 182 Transformer temperature detection unit (temperature
- 20 detection unit)
- 184 Rectifier temperature detection unit (temperature
- detection unit)
- 190 Welding gun
- 200 Electrode
- 25

CLAIMS

1. A resistance welder controller for use with a resistance welder, the resistance welder controller comprising:

5 a control unit that controls a welding current flowing through an inverter;

a current detection unit that detects the welding current flowing through the inverter;

a usage rate calculation unit that measures an energizing time and a point time interval of the welding current that has been detected, and activates a usage rate measurement mode or an average usage rate measurement mode and calculates a usage rate of the inverter using the energizing time and the point time interval that have been measured;

a storage unit that stores an equivalent current curve indicating a relationship between a current value of the welding current and the usage rate of the inverter when the inverter is operated at a rated capacity; and

20 a determination unit that determines whether a relationship between the current value of the detected welding current and the calculated usage rate of the inverter exceeds the rated capacity of the inverter based on the equivalent current curve, continues an operation of the control unit when the relationship between the current value of the detected welding current and the calculated usage rate of the inverter does not exceed the rated capacity of the inverter, and stops the operation of the control unit when the relationship between the current value of the detected welding current and the calculated usage rate of the inverter exceeds the rated capacity of the inverter.

2. The resistance welder controller according to claim 1, wherein, when the usage rate measurement mode is activated, the usage rate calculation unit measures the energizing time and the point time interval of the detected welding current for each point, and calculates the usage rate of the inverter using the energizing time and the point time interval that have been measured.

3. The resistance welder controller according to claim 1, wherein, when the average usage rate measurement mode is activated, the usage rate calculation unit measures the energizing time and the point time interval of the detected welding current for each of a plurality of points, or for each fixed time, and calculates an average energizing time or an average point time interval for each of the plurality of points that have been measured or for each fixed time, and calculates the average usage rate of the inverter using the average energizing time or the average point time interval that have been calculated.

4. The resistance welder controller according any one of claims 1 to 3, wherein the determination unit plots an intersection of the current value of the detected welding current and the calculated usage rate of the inverter on a graph drawn using the equivalent current curve stored in the storage unit, determines that the relationship between the current value of the detected welding current and the calculated usage rate of the inverter does not exceed the rated capacity of the inverter when the plotted intersection is positioned below the equivalent current curve, and determines that the relationship between the

current value of the detected welding current and the calculated usage rate of the inverter exceeds the rated capacity of the inverter when the plotted intersection is positioned above the equivalent current curve.

5

5. The resistance welder controller according to any one of claims 1 to 4, wherein the current value, the energizing time, and the point time interval of the welding current detected by the current detection unit, and the usage rate of the inverter calculated by the usage rate calculation unit are transmitted to an external computer, and

the external computer stores and monitors the current value, the energizing time, and the point time interval of the welding current, and the usage rate of the inverter.

15

6. The resistance welder controller according to claim 4, wherein the current value of the welding current detected by the current detection unit and the usage rate of the inverter calculated by the usage rate calculation unit are transmitted to an external computer, and

the external computer plots the intersection of the current value of the detected welding current and the calculated usage rate of the inverter on the graph drawn using the equivalent current curve stored in the storage unit, and monitors whether the relationship between the current value of the welding current and the usage rate of the inverter exceeds the rated capacity of the inverter.

7. The resistance welder controller according to claim 5 or 6, further comprising a temperature detection unit that detects a temperature of the inverter,

wherein the temperature of the inverter detected by

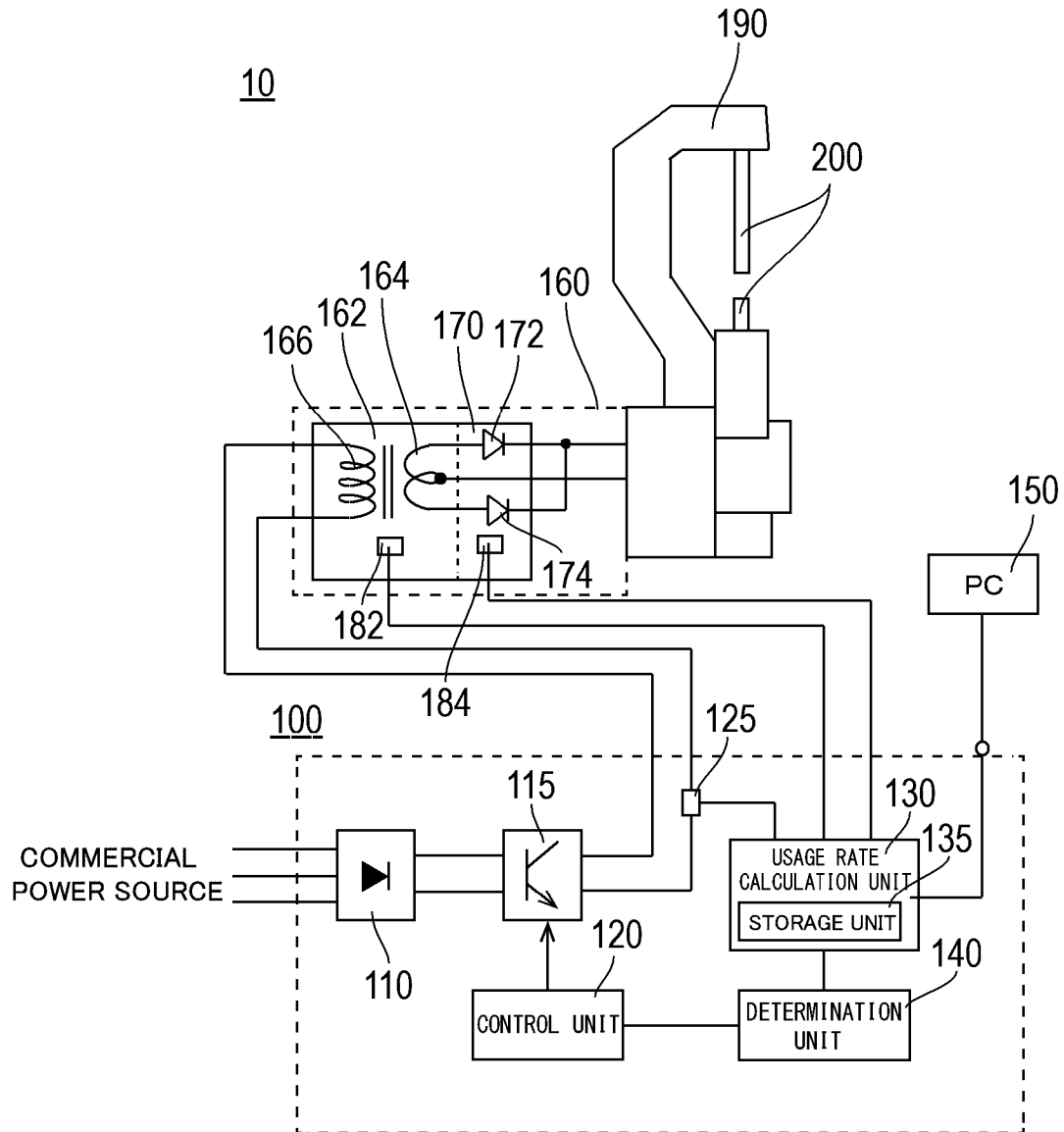
the temperature detection unit is transmitted to the external computer, and

the external computer stores and monitors the temperature of the inverter.

5

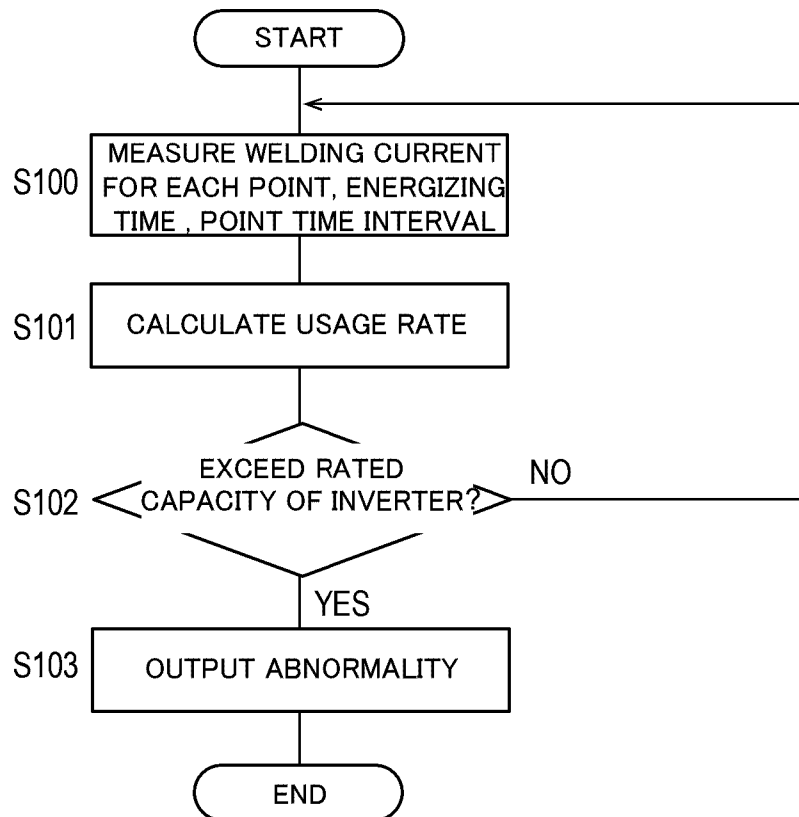
8. The resistance welder controller according to claim 7, wherein the temperature detection unit includes a transformer temperature detection unit that detects a temperature of a transformer that generates the welding
10 current, and a rectifier temperature detection unit that detects a temperature of a rectifier that rectifies the welding current generated by the transformer.

【FIG 1】



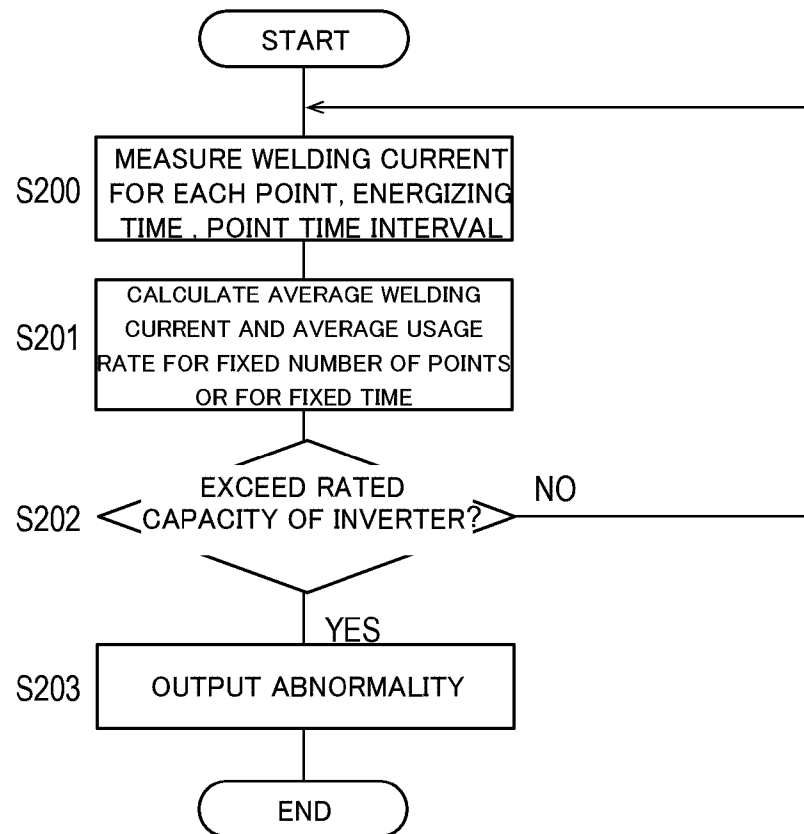
【FIG 2】

USAGE RATE MEASUREMENT MODE

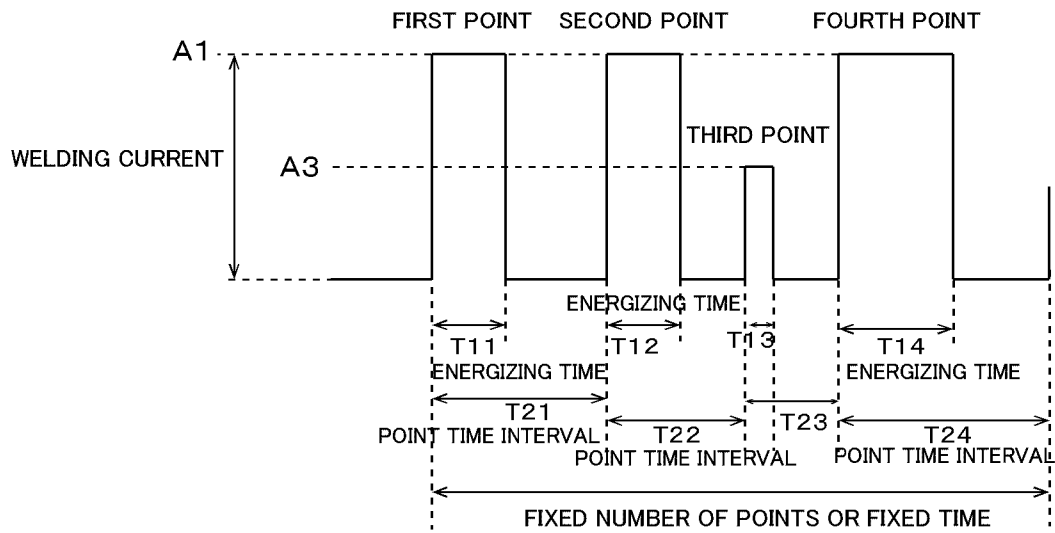


【FIG 3】

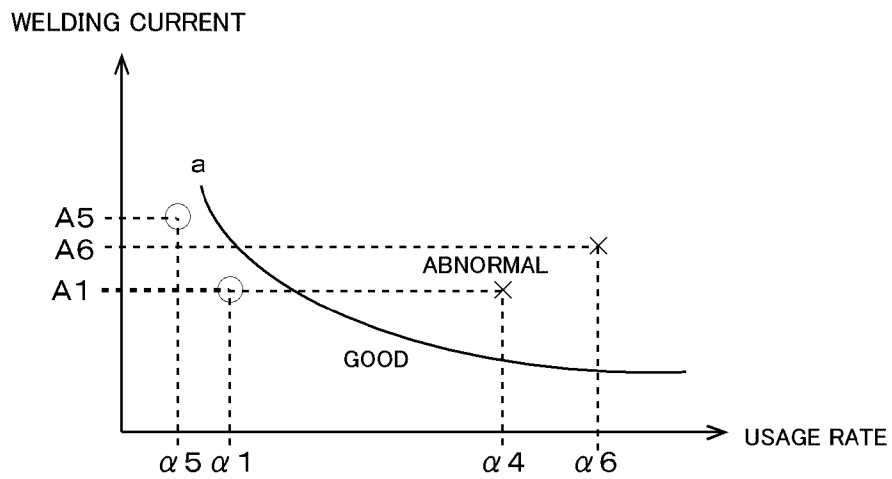
AVERAGE USAGE RATE MEASUREMENT MODE



【FIG 4】



【FIG 5】



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