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(54) **A WASHER/DRYER COMPRISING A RELAY DETERMINING ROTATIONAL DIRECTION OF THE MOTOR**

WASCHMASCHINE/TROCKNER MIT RELAIS ZUR BESTIMMUNG DER DREHRICHTUNG DES MOTORS

MACHINE À LAVER SÉCHANTE COMPRENANT UN RELAIS QUI DÉTERMINE LA DIRECTION DE ROTATION DU MOTEUR

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Description

[0001] The present invention relates to a washer/dryer wherein the rotational direction of the motor can be changed by a relay.

[0002] In washer/dryers, a drum and a motor that provides the drum to be rotated are included. Starting-up, stopping and the rotational direction of the motor are determined by a control circuit. When the relay that determines the rotational direction of the motor is in the first position, the current feeds the arm that rotates the motor clockwise. When the motor is desired to be rotated in the reverse direction, the current is delivered on the relay coil and the relay contacts the other arm of the motor. , the motor direction relay can adhere to the contacted arm as a result of a problem occurred in the coil or short circuit. In this case, the relay continues to deliver electricity only to the arm it has adhered to even though the control unit gives the command to the relay for delivering electricity to the arm of the motor providing clockwise rotation for a certain time period, and to the arm providing counterclockwise rotation for a certain time period. This causes overloading in the circuit elements through which current flows in excess of their requirements. The circuit elements subjected to overloading for a long time may malfunction in the course of time. For example, if the motor direction relay in a dryer adheres to the arm of the motor providing counterclockwise rotation, air circulation cannot be provided properly and the heaters that provide the air to be heated cause the ambient environment to be overheated. In the state of the art, various tests are performed with the software installed in the control circuit in order to understand the problem of relay adherence.

[0003] In one of the state of the art embodiments, the United States Patent Document No. US3909955, a clothes dryer is explained having an integrated circuit control for monitoring motor relay malfunction state. The United States Patent Document No. US4338730 A discloses a dryer wherein wet clothing placed in a drying chamber is dried by hot air resulting from the heat generated by an electric heater. The dryer comprises a ventilation fan which draws off air streams from the drying chamber and introduces the same amount of air streams as those thus removed into the drying chamber during a drying cycle.

[0004] The aim of the present invention is the realization of a washer/dryer wherein the relay error can be detected easily.

[0005] The washer/dryer realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a relay providing rotational direction of the motor to be changed and a control circuit having a measuring unit connected to one of the motor windings for detecting relay adherence.

[0006] The control unit regulates the operational program of the washer/dryer by monitoring functioning of the components like the motor, heater, pump, valve, fan that are disposed in the washer/dryer. Right and/or left

rotation of the drum, wherein the laundry is placed during the washing/drying phase, is provided by the motor. While the motor rotates in one direction when electricity is delivered to its main winding, it rotates in the other direction when electricity is delivered to its auxiliary winding. Electricity is delivered to the motor windings by changing the place of a relay that is handled by the control circuit. In some abnormal conditions, the relay may adhere to the contacted winding and cannot be released from the said winding even though the control circuit commands to shift to the other winding. The measuring unit disposed in the control circuit is connected to one of the windings so that this adherence situation can be detected. The measuring unit that measures the electrical data in the winding provides relay adherence situation to be detected.

[0007] In an embodiment of the present invention, the control unit ends the operational program and warns the user when the relay adherence is detected in accordance with the data received from the measuring unit.

[0008] In an embodiment of the present invention, the measuring unit measures the voltage of the winding to which it is connected.

[0009] In an embodiment of the present invention, the measuring unit is a voltage measuring circuit that measures the mains voltage by which the control circuit is fed. The motor, operation of which is appropriate when the mains voltage is, for example around 230 V, cannot start up when the mains voltage is 170 V. For example, the heater can be also damaged over 260 V when the mains voltage is around 220 V. Therefore, the measuring unit also monitors the mains voltage and enables the operational program to start by delivering electricity to the components within the interval of around 190V-250V. By means of using the measuring unit disposed in the control circuit for also detecting relay adherence situation, an additional device is not required to be used for detecting relay adherence situation.

[0010] In another embodiment of the present invention, the measuring unit measures the current passing through the winding to which it is connected.

[0011] In another embodiment of the present invention, the measuring unit comprises a switching circuit that becomes open circuit when the voltage in the winding to which it is connected reaches a certain value.

[0012] In another embodiment of the present invention, the measuring unit is an impedance measuring circuit that measures the impedance in the winding to which it is connected.

[0013] In an embodiment of the present invention, the measuring unit is connected to the main winding which draws high current.

[0014] In an embodiment of the present invention, the measuring unit is connected to the auxiliary winding.

[0015] In the washer/dryer of the present invention, the measuring unit is connected to the main winding or the auxiliary winding and the control circuit detects whether or not the relay has adhered to one of the windings.

[0016] A washer/dryer realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the schematic view of a washer/dryer.

Figure 2 - is the schematic view of a control circuit when the relay is in the first position.

Figure 3 - is the schematic view of a measuring unit connected to the main winding while the relay is in the first position in an embodiment of the present invention.

Figure 4 - is the schematic view of a measuring unit connected to the main winding while the relay is in the second position in an embodiment of the present invention.

[0017] The elements illustrated in the figures are numbered as follows:

1. Washer/dryer
2. Motor
3. Relay
4. Control circuit
5. Measuring unit
6. Capacitor

[0018] The washer/dryer (1) of the present invention comprises a drum wherein the laundry is placed, a motor (2) that provides the drum to be rotated, having a main winding (MW) and an auxiliary winding (AW) and a relay (3) providing the motor (2) to rotate in one direction when connected to the main winding (MW) of the motor (2) and providing the motor (2) to rotate in the other direction when connected to the auxiliary winding (AW) of the motor (2), providing the motor (2) to rotate in the other direction, a capacitor (6) disposed between the windings (MW and AW) and a control circuit (4) that determines the position of the relay (3), providing control of the washing parameters.

[0019] The washer/dryer (1) furthermore comprises a measuring unit (5), disposed in the control circuit (4), electrically connected to the main winding (MW) or the auxiliary winding (AW) of the motor (2), providing the position of the relay (3) to be determined from the measured electrical data by detecting whether or not the current delivered from the mains to the main winding (MW) or the auxiliary winding (AW) passes through the capacitor (6).

[0020] The relay (3) comprises a coil (not shown in the figures) that generates a magnetic field when current is delivered by the control circuit (4) and changes the position of the relay (3) with the effect of the magnetic field. The motor (2), rotating clockwise when the relay (3) is in the first position, starts to rotate in the opposite direction by means of the relay (3) shifting to the second position as current is fed to the coil of the relay (3). The relay (3) can adhere to the contact tip of the contacted winding (MW or AW) as a result of a malfunction in the relay (3)

or due to the current delivered to the motor (2) being too high. When the relay (3) adheres to the contact tip of the winding (MW or AW), it delivers current to that winding (MW or AW) for a longer time than necessary. Therefore, the motor (2) rotates in the same direction for a longer time than required or rotates in the same direction continuously. The measuring unit (5) disposed in the control circuit (4) can measure the electrical data of the winding (MW or AW) to which it is connected by means of the current in the capacitor (6) between the windings (MW or AW).

[0021] In the embodiment wherein the measuring unit (5) is connected to the main winding (MW), the capacitor (6) is connected in series to the auxiliary winding (AW) and in parallel to the main winding (MW) while the relay (3) is connected to the main winding (MW). The measuring unit (5) measures the data received directly from the mains since the effect of the capacitor (6) does not exist (Figure 3). In this embodiment wherein the measuring unit (5) is connected to the main winding (MW), the capacitor (6) is connected in series to the main winding (MW) while the relay (3) is connected to the auxiliary winding (AW) (Figure 4). The measuring unit (5) this time measures the data received from the capacitor (6) and the mains on the main winding (MW) (Figure 4).

[0022] The measuring unit (5) measures the data received from the mains when the relay (3) is connected to the winding (MW or AW) the measuring unit (5) is connected to. The measuring unit (5) measures the total of the mains data and the capacitor (6) data when the relay (3) is connected to the winding (MW or AW) the measuring unit (5) is not connected to. Thus, the control circuit (4) determines which winding (MW or AW) the relay (3) is connected to depending on the measured data.

[0023] In an embodiment of the present invention, the control circuit (4) controls adherence of the relay (3) by comparing the detected relay (3) position with the position the relay (3) has to be located, which is prerecorded in its memory. For example, the control circuit (4) comprises a safety algorithm that provides the current delivered to the relay (3) to be cut off when the adherence of the relay (3) is detected. Or mechanical motion is provided by means of a switch disposed in the control circuit (4) and the relay (3) is provided to be released from the winding (MW or AW) to which it has adhered. Consequently, the motor (2) is prevented from continuously rotating in the same direction and from overspeeding, thus safety is maintained.

[0024] In an embodiment of the present invention, the control circuit (4) warns the user by ending the operational program of the washer/dryer (1) when the relay (3) adherence is detected and/or cannot be resolved. The motor (2) is stopped if error recovery program is not included in the control circuit (4) or if error recovery cannot be performed.

[0025] In an embodiment of the present invention, the measuring unit (5) is a voltage measuring circuit that measures the voltage on the winding (MW or AW) to

which it is connected. The relay (3) adherence situation can be detected by the measured voltage value.

[0026] In an embodiment of the present invention, the control circuit (4) controls whether or not the mains voltage is within the mains voltage values prerecorded in the memory of the control circuit (4) by the producer, in cases where the measuring unit (5) measures the mains voltage, for example when the measuring unit (5) and the relay (3) are connected to the main winding (MW). There is a minimum voltage value required for the motor (2) to start up. There is a maximum voltage value by which various components located on the control circuit (4) and elements such as the heater, fan disposed in the washer/dryer (1) fed by the mains voltage can be fed without being damaged. Therefore, in cases where the measuring unit (5) measures the mains voltage, the control unit (4) does not start the operational program of the washer/dryer (1) if the measured voltage value is not between the minimum and maximum voltage values recorded in its memory.

[0027] In another embodiment of the present invention, the measuring unit (5) is a current measuring circuit that measures the current passing from the winding (MW or AW) to which it is connected. The control circuit (4) compares the measured voltage value with the voltage value that has to pass through the measuring unit (5) under normal conditions, prerecorded in its memory by the producer, and determines adherence situation of the relay (3).

[0028] In an embodiment of the present invention, the measuring unit (5) comprises a switching element, for example a diode, that switches when a certain voltage difference occurs between the winding (MW or AW) to which it is connected and the output of the motor (2).

[0029] In another embodiment of the present invention, the measuring unit (5) is an impedance measuring circuit that measures the impedance of the winding (MW or AW) to which it is connected. The measuring unit (5) enables to determine the adherence situation of the relay (3) from the difference in the impedance, named as resistivity, calculated from the ratio of the voltage on the winding (MW or AW) to the current.

[0030] By means of the measuring unit (5) disposed in the washer/dryer (1) of the present invention, whether or not the relay (3), determining rotational direction of the motor (2), has adhered to the main winding (MW) or the auxiliary winding (AW) of the motor (2) can be easily detected from the differences in the measured electrical data. Consequently, the washer/dryer (1) is provided to operate safely.

[0031] It is to be understood that the present invention is not limited to the embodiments disclosed above and a person skilled in the art can easily introduce different embodiments. These should be considered within the scope of the protection postulated by the claims of the present invention.

Claims

1. A washer/dryer (1) comprising a drum, a motor (2) that provides the drum to rotate, having a main winding (MW) and an auxiliary winding (AW) and a relay (3) providing the motor (2) to rotate in one direction when connected to the main winding (MW) of the motor (2) and providing the motor (2) to rotate in the other direction when connected to the auxiliary winding (AW), a capacitor (6) disposed between the windings (MW and AW) and a control circuit (4) determining the position of the relay (3), providing control of the washing parameters **and characterized by** a measuring unit (5) disposed in the control circuit (4), electrically connected to the main winding (MW) or the auxiliary winding (AW) of the motor (2), providing the position of the relay (3) to be determined from the measured electrical data by detecting whether the current delivered from the mains to the main winding (MW) or the auxiliary winding (AW) passes through the capacitor (6).
2. A washer/dryer (1) as in Claim 1, **characterized by** the control circuit (4) that controls adherence of the relay (3) by comparing the detected relay (3) position with the position the relay (3) has to be located which is prerecorded in its memory.
3. A washer/dryer (1) as in Claim 1 and 2, **characterized by** the control circuit (4) that warns the user by ending the operational program of the washer/dryer (1) when the relay (3) adherence situation is detected and/or cannot be resolved.
4. A washer/dryer (1) as in Claim 1 or 2, **characterized by** the measuring unit (5) which is a voltage measuring circuit that measures the voltage on the winding (MW or AW) to which it is connected.
5. A washer/dryer (1) as in Claim 1 or 2, **characterized by** the control circuit (4) that controls whether or not the mains voltage is within the mains voltage values prerecorded in its memory by the producer.
6. A washer/dryer (1) as in Claim 1 or 2, **characterized by** the measuring unit (5) which is a current measuring circuit that measures the current passing through the winding (MW or AW) to which it is connected.
7. A washer/dryer (1) as in Claim 1 or 2, **characterized by** the measuring unit (5) that comprises a switching element, that switches when a certain voltage difference occurs between the winding (MW or AW) to which it is connected and the output of the motor (2).
8. A washer/dryer (1) as in Claim 1 or 2, **characterized by** the measuring unit (5) which is an impedance

measuring circuit that measures the impedance of the winding (MW or AW) to which it is connected.

Patentansprüche

1. Wasch-/Trockenvorrichtung (1), umfassend eine Trommel, einen Motor (2), der dafür sorgt, dass sich die Trommel dreht, und eine Hauptwicklung (MW) und eine Hilfswicklung (AW) und ein Relais (3) aufweist, das dafür sorgt, dass sich der Motor (2) in einer Richtung dreht, wenn es mit der Hauptwicklung (MW) des Motors (2) verbunden ist, und dafür sorgt, dass sich der Motor (2) in der anderen Richtung dreht, wenn es mit der Hilfswicklung (AW) verbunden ist, einen Kondensator (6), der zwischen den Wicklungen (MW und AW) angeordnet ist, und eine Steuerschaltung (4), die die Stellung des Relais (3) bestimmt und eine Steuerung der Waschparameter ermöglicht, **und gekennzeichnet durch** eine Messeinheit (5), die in der Steuerschaltung (4) angeordnet ist und elektrisch mit der Hauptwicklung (MW) oder der Hilfswicklung (AW) des Motors (2) verbunden ist und es ermöglicht, dass die Stellung des Relais (3) anhand der gemessenen elektrischen Daten bestimmt wird, indem erkannt wird, ob der Strom, der vom Stromnetz an die Hauptwicklung (MW) oder der Hilfswicklung (AW) geleitet wird, **durch** den Kondensator (6) fließt.
2. Wasch-/Trockenvorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Steuerschaltung (4) die Anhaftung des Relais (3) steuert, indem sie die erkannte Stellung des Relais (3) mit der Stellung vergleicht, in der sich das Relais (3) befinden muss und die in ihrem Speicher im Voraus aufgezeichnet wurde.
3. Wasch-/Trockenvorrichtung (1) nach Anspruch 1 und 2, **dadurch gekennzeichnet, dass** die Steuerschaltung (4) den Benutzer warnt, indem sie das Betriebsprogramm der Wasch-/Trockenvorrichtung (1) beendet, wenn die Anhaftungssituation des Relais (3) erkannt wird und/oder nicht behoben werden kann.
4. Wasch-/Trockenvorrichtung (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Messeinheit (5) eine Spannungsmessschaltung ist, die die Spannung an der Wicklung (MW oder AW) misst, mit der sie verbunden ist.
5. Wasch-/Trockenvorrichtung (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Steuerschaltung (4) steuert, ob die Versorgungsspannung innerhalb der Versorgungsspannungswerte liegt, die vom Hersteller im Voraus in ihrem Speicher aufgezeichnet werden.

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6. Wasch-/Trockenvorrichtung (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Messeinheit (5) eine Strommessschaltung ist, die den Strom misst, der durch die Wicklung (MW oder AW) fließt, mit der sie verbunden ist.

7. Wasch-/Trockenvorrichtung (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Messeinheit (5) ein Schaltelement umfasst, das umschaltet, wenn eine bestimmte Spannungsdifferenz zwischen der Wicklung (MW oder AW), mit der sie verbunden ist, und dem Ausgang des Motors (2) auftritt.

8. Wasch-/Trockenvorrichtung (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Messeinheit (5) eine Impedanzmessschaltung ist, die die Impedanz der Wicklung (MW oder AW) misst, mit der sie verbunden ist.

Revendications

1. Une machine à laver/sécher (1) comprenant un tambour, un moteur (2) qui permet la rotation du tambour et présente un enroulement principal (MW) et un enroulement auxiliaire (AW) et un relais (3) permettant la rotation du moteur (2) dans un sens lorsqu'il est relié à l'enroulement principal (MW) du moteur (2) et permettant la rotation du moteur (2) dans l'autre sens lorsqu'il est relié à l'enroulement auxiliaire (AW), un condensateur (6) disposé entre les enroulements (MW et AW) et une unité de commande (4) qui détermine la position du relais (3) et permet le contrôle des paramètres de lavage **et caractérisée par** une unité de mesure (5) qui est arrangée dans l'unité de commande (4), qui est reliée électriquement à l'enroulement principal (MW) ou l'enroulement auxiliaire (AW) du moteur (2) et qui assure que la position du relais (3) est déterminée à partir des données électriques mesurées en détectant si le courant délivré à partir du réseau à l'enroulement principal (MW) ou l'enroulement auxiliaire (AW) passe à travers le condensateur (6).
2. Une machine à laver/sécher (1) selon la Revendication 1, **caractérisée par** l'unité de commande (4) qui contrôle l'adhésion du relais (3) en comparant la position détectée du relais (3) avec la position souhaitée du relais (3) qui est préenregistrée dans sa mémoire.
3. Une machine à laver/sécher (1) selon la Revendication 1 et 2, **caractérisée par** l'unité de commande (4) qui avertit l'utilisateur en mettant fin au programme de fonctionnement de la machine à laver/sécher (1) lorsque la situation d'adhérence du relais (3) est détectée et/ou ne peut pas être résolue.

4. Une machine à laver/sécher (1) selon la Revendication 1 ou 2, **caractérisée par** l'unité de mesure (5) qui est un circuit de mesure de tension qui mesure la tension sur l'enroulement (MW ou AW) auquel il est relié. 5
5. Une machine à laver/sécher (1) selon la Revendication 1 ou 2, **caractérisée par** l'unité de commande (4) détermine si ou non la tension du réseau s'inscrit dans les valeurs de tension du réseau préenregistrées dans sa mémoire par le fabricant. 10
6. Une machine à laver/sécher (1) selon la Revendication 1 ou 2, **caractérisée par** l'unité de mesure (5) qui est un circuit de mesure de courant qui mesure le courant passant à travers l'enroulement (MW ou AW) auquel il est relié. 15
7. Une machine à laver/sécher (1) selon la Revendication 1 ou 2, **caractérisée par** l'unité de mesure (5) qui comprend un élément de commutation qui commute lorsqu'une certaine différence de tension se produit entre l'enroulement (MW ou AW) auquel il est relié et la sortie du moteur (2). 20
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8. Une machine à laver/sécher (1) selon la Revendication 1 ou 2, **caractérisée par** l'unité de mesure (5) qui est un circuit de mesure d'impédance qui mesure l'impédance de l'enroulement (MW ou AW) auquel il est relié. 30
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Figure 1

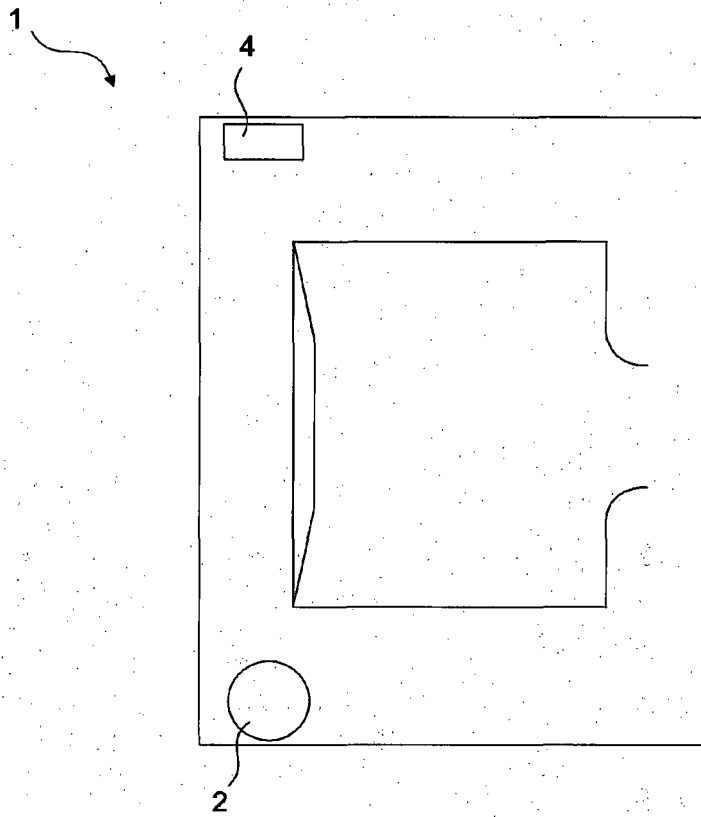


Figure 2

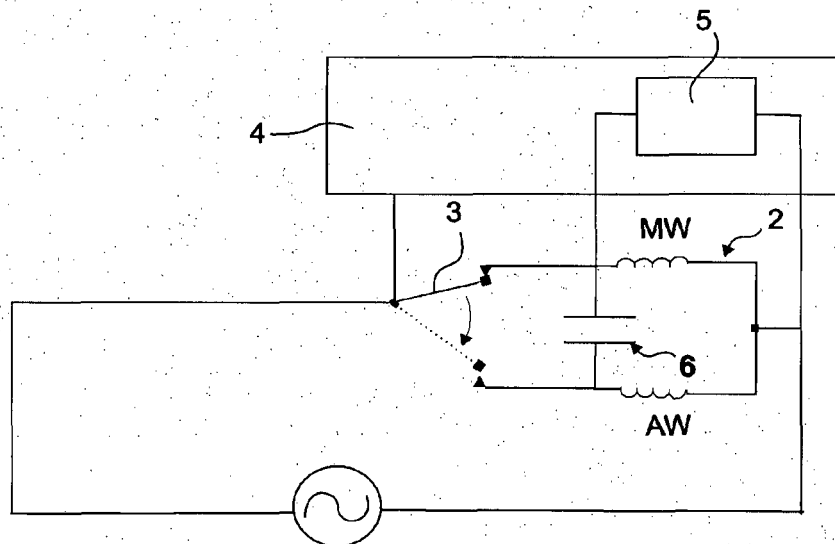


Figure 3

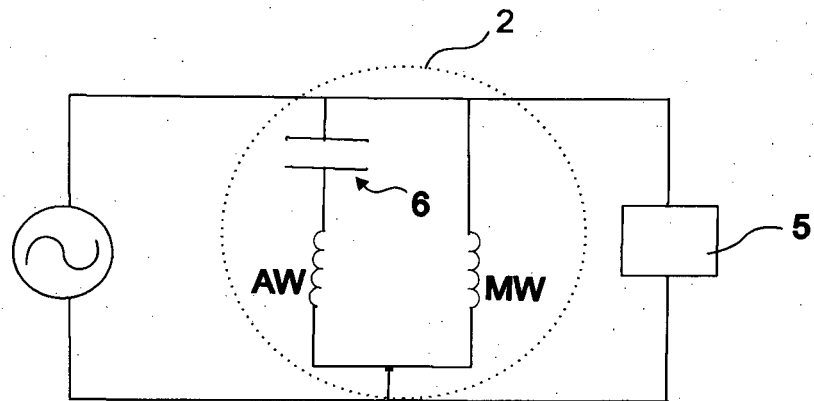
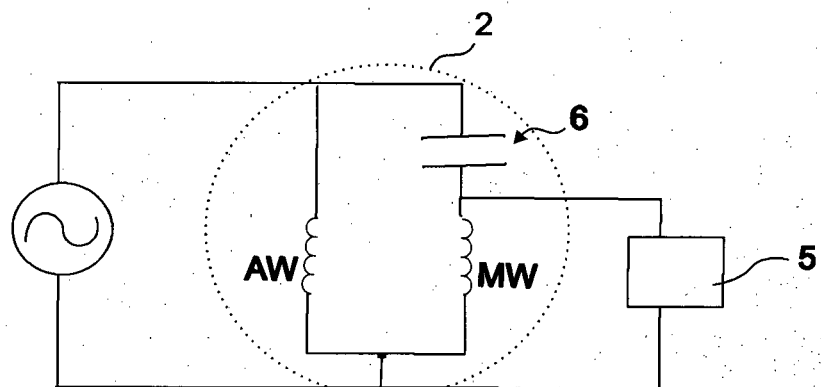


Figure 4



REFERENCES CITED IN THE DESCRIPTION

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