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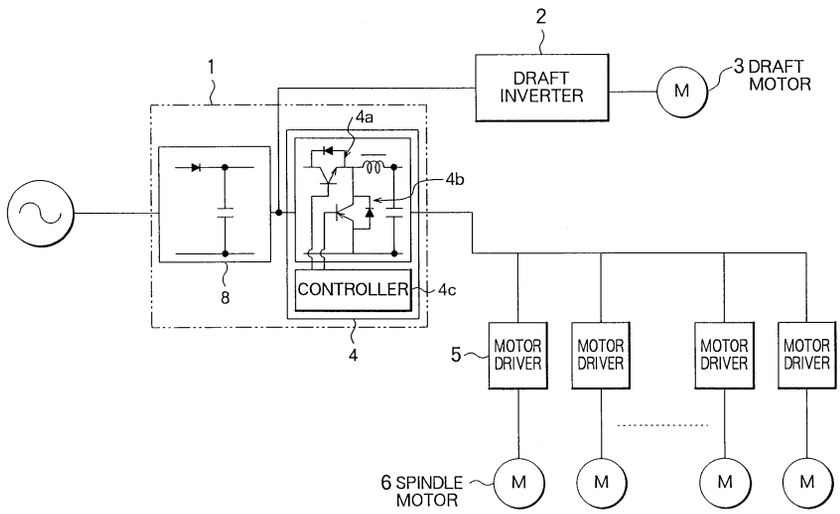
(54) System for feeding electric power to motors for use in textile machine

(57) There is provided a system for feeding an electric power to motors for use in a textile machine, which serves to feed the electric power to both of a plurality of spindle motors for driving individually a plurality of spindles and a draft motor for driving a draft roller, the system comprising: a converter portion for rectifying an A.C. current that has been obtained from an A.C. power source into a D.C. current; and a chopper portion for adjusting the output voltage of the D.C. current that has been obtained by the conversion in the converter portion, the electric power which has been outputted from the converter portion being fed to the draft motor through a draft inverter, the electric power which has been outputted from the chopper portion being fed to the plurality of spindle motors through a draft driver.

FIG. 2



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Description

BACKGROUND OF THE INVENTION

1. Field of the invention

[0001] The present invention relates to a system for feeding the electric power to motors for use in a textile machine. More particularly, the present invention relates, in a textile machine, such as a spindle drive type fine spinning frame, including a plurality of spindles and a large number of draft rollers, to an electric power feeding system for a textile machine of a single spindle drive type which comprises spindle motors for driving individually a plurality of spindles.

2. Description of the Related Art

[0002] In a textile machine of a single spindle drive type as described above, a spindle drive portion and a draft drive portion are separately included therein, and in many cases, the spindle drive portion for driving a plurality of spindles utilizing a single spindle is constituted of discrete drive motors such as D.C. brushless motors and also the draft drive portion is constituted of an inverter or a servo motor.

[0003] The technology is proposed in Japanese Patent Laid-Open No. 4-207998, with respect to the case where the spindle drive portion is constituted of discrete drive motors such as D.C. brushless motors, a D.C. that power source voltage which is obtained by the reduction of the original voltage through the chopper power source common to the draft motor and each of the spindle motors is supplied to both of the draft motor and each of the spindle motors.

[0004] However, in the case where the power source voltage which is obtained by the reduction of the original voltage through the chopper power source is supplied to the draft motor, there arises the problem that the power source voltage supplied to the draft motor becomes the low voltage of about D.C. 150 V, and hence the inverter for various purposes or the servo motor for various purposes can not be used as the draft motor.

[0005] That is, in a conventional circuit as shown in Fig. 1, the three-phase commercial A.C. power source voltage of 380 to 460 V is converted into the D.C. power source voltage through a chopper power source 10 and the resultant D.C. power source voltage is supplied to a draft inverter 20 for a draft motor 30 as well as to each of spindle motors 50 through a large number of motor drivers 40.

[0006] For this reason, for example, if the three-phase power source voltage of the 400 V class is inputted as the A.C. power source voltage to the chopper power source 10 common to the draft motor 30 and each of the spindle motors 50, then the D.C. output voltage from the chopper power source 10 is inputted to both of the draft inverter 20 for the draft motor 30 and each of the drivers 40 for the discrete spindle motors 50 such as the D.C. brushless motors.

[0007] The spindle motor 50 has a small capacity. Then, if these spindle motors 50 and the power devices as the motor drivers 40 are made the high-voltage withstanding elements, these high-voltage withstanding elements become expensive. Therefore, the D.C. voltage outputted from the chopper power source 10 is reduced through the chopper. For this reason, the D.C. voltage which is supplied from the common chopper power source 10 to the draft inverter 20 also becomes the low voltage.

[0008] The spindle motor 50 is a dedicated motor in terms of its specification, and hence the motor for various purposes is hardly employed therefor. Therefore, since the spindle motor 50 is not the motor for various purposes, its cost is essentially high. On the other hand, for the draft motor 30 and the draft inverter 20 therefor, the products for various purposes can be essentially employed in terms of their specifications. However, as described above, the D.C. power source voltage to the draft inverter 20 is obtained by the reduction of the commercial A.C. power source voltage through the chopper power source 10, and hence in such a low voltage state, any of the products for various purposes can not be employed as the draft motor 30 and the draft inverter 20. For this reason, the draft inverter 20 and the draft motor 30 are both the special specification products and hence are very expensive.

SUMMARY OF THE INVENTION

[0009] In the light of the foregoing, the present invention was made in order to solve the above-mentioned problems associated with the prior art, and therefore, an object of the present invention is to provide a system for feeding the electric power to motors for use in a textile machine in which products for various purposes are enabled to be used as a draft motor and a draft inverter for driving the draft motor to reduce the installation cost.

[0010] According to an aspect of the present invention, there is provided a system for feeding the electric power to motors for use in a textile machine, which serves to feed the electric power to both of a plurality of spindle motors for driving individually a plurality of spindles and a draft motor for driving a draft roller, the system comprising: a converter portion for rectifying an A.C. current that has been obtained from an A.C. power source into a D.C. current; and a chopper portion for adjusting the output voltage of the D.C. current that has been obtained by the conversion in the converter portion, the electric power which has been outputted from the converter portion being fed to the draft motor, the electric power which has been outputted from the chopper portion being fed to the plurality of spindle motors.

BRIEF DESCRIPTION OF THE INVENTION

[0011]

Fig. 1 is a block diagram showing a circuit configuration of a conventional electric power feeding system;
Fig. 2 is a block diagram showing a circuit configuration of an electric power feeding system of an embodiment according to the present invention; and
Fig. 3 is a block diagram showing a circuit configuration of an electric power feeding system of another embodiment according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] Hereinafter, the preferred embodiments of the present invention will hereinafter be described in detail with reference to the accompanying drawings.

Embodiment 1

[0013] Fig. 2 is a block diagram showing a circuit configuration of an electric power feeding system of an embodiment 1 according to the present invention. In Fig. 2, a three-phase commercial A.C. power source of 380 to 460 V is connected to a chopper power source 1. The chopper power source 1 includes a converter portion 8 for rectifying an A.C. current that has been obtained from the A.C. power source into a D.C. current, and a chopper portion 4 for adjusting the output voltage of the D.C. current that has been obtained by the rectification in the converter portion 8.

[0014] In this embodiment, the chopper portion 4 comprises: a reducing chopper 4a for reducing the D.C. power source voltage that has been obtained by the rectification in the converter portion 8; a boosting chopper 4b for boosting the D.C. power source voltage that has been obtained by the rectification in the converter portion 8; and a controller 4c for carrying out the switching control for the reducing chopper 4a and the boosting chopper 4b. The chopper portion 4 is connected to each of spindle motors 6 through the respective motor drivers 5.

[0015] The controller 4c carries out the control in such a way that, with respect to the reducing chopper 4a and the boosting chopper 4b, in the power running, the reducing chopper 4a is operated at the time when the voltage on the load side starts to drop, and in the regeneration, the boosting chopper 4b is operated at the time when the voltage on the load side starts to rise.

[0016] On the other hand, the D.C. power source voltage which has been obtained by the rectification in the converter portion 8 of the chopper power source 8 is supplied to the draft motor 3 through the draft inverter 2.

[0017] In this embodiment, in the chopper power source 1 to which the A.C. power source voltage is supplied, the A.C. current is rectified in the converter portion 8 and then the D.C. current component which has been taken out in the converter portion 8 is supplied to the draft inverter 2. Therefore, the products for various purposes of, for example, the 400 V class (or the 200 V class when the input A.C. voltage is in the range of 200 to 220 V) which corresponds to the A.C. power source voltage can be used as the draft motor 3 and the draft inverter 2 so that the cost of the draft motor 3 and the draft inverter 2 can be remarkably reduced.

[0018] On the other hand, the D.C. power source voltage which has been obtained by the reduction of the original voltage in the chopper portion 4 of the chopper power source 1 is supplied to each of the motor drivers 5 of respective spindles which are driven by the single spindle. As described above, since each of the spindle motors 6 is the product specially made to order, i.e., the dedicated motor, even if such a D.C. power source voltage obtained by the reduction of the original voltage is used, there is no need to worry about a sudden rise in the price caused thereby. Incidentally, if the D.C. power source voltage obtained by reducing in the chopper portion 4 is reduced too much, then the feeding current to each of the motor drivers 5 is increased so that the diameter of the feeding line becomes large. For this reason, it is proper that the power source voltage of about D.C. 150 V with which the pass device withstanding the D.C. 250 V can be used is supplied to each of the motor drivers 5.

[0019] In addition, in the chopper portion 4, the boosting chopper 4b is provided in parallel with the reducing chopper 4a that operates in the steady running so that the regenerative energy from each of the spindle motors 6 can be withdrawn to the converter portion 8 in stopping operation, whereby each of the spindles which are coupled to the respective spindle motors 6 can be stopped with the suitable slowdown gradient in the interruption of the active power supply. In addition, the regenerative energy is generated by each of the spindle motors 6, whereby the draft roller can be stopped synchronously with each of the spindles without exhausting the energy of the draft motor 6.

Embodiment 2

[0020] An embodiment 2 of the present invention will be described with reference to Fig. 3. In the present embodiment shown in Fig. 3, the A.C. power source voltage is supplied to a draft motor 3 through a converter portion 9 and a draft inverter 2. In addition, each of single spindle drive type spindle motors 6 is driven through a chopper power supply 1 including a converter portion 8 and a chopper portion 4 and also through a motor driver 5 by the A.C. power source voltage. It is preferable that the chopper portion 4 comprises, similarly to the abovementioned embodiment 1, the reducing chopper 4a and the boosting chopper 4b.

[0021] Also, it is preferable that only one converter

portion 8 is provided for all of the spindle motors 6 and several spindle motors 6 are grouped for the chopper portion 4, and one chopper portion 4 is provided for every group of spindle motors.

[0022] In this embodiment 2 as well, since the A.C. power source voltage is supplied to the draft inverter 2 and the draft motor 3, the products for various purposes can be used as the draft inverter 2 and the draft motor 3 and hence no product specially made to order is required therefor. Therefore, the sudden rise in the price thereof can be prevented.

[0023] According to the present invention, in a textile machine which is designed so as to be single-spindle-driven by a single spindle drive type motor such as a D. C. brushless motor having a discrete driver, the power source voltage which is obtained by the reduction of the original voltage in order to drive spindles is not supplied to both of the draft inverter for driving the draft motor and the draft motor, but the power source voltage corresponding to the commercial A.C. power source voltage is supplied thereto. Therefore, the power source voltage which is supplied to both of the draft motor and the draft inverter is not excessively reduced and hence the inexpensive products for various purposes can be used as the draft motor and the draft inverter. Hence, it is possible to reduce the installation cost of the textile machine.

[0024] In addition, in the present invention, though there is provided the system in which, despite that the voltage is different between each of the spindle driving motors and the draft motor, the conventional synchronous stopping method can be adopted by providing the chopper power source for the spindle motors with the regeneration function.

Claims

1. A system for feeding an electric power to motors for use in a textile machine, which serves to feed the electric power to both of a plurality of spindle motors for driving individually a plurality of spindles and a draft motor for driving a draft roller, said system comprising:

   a converter portion for rectifying an A.C. current that has been obtained from an A.C. power source into a D.C. current; and
   a chopper portion for adjusting the output voltage of the D.C. current that has been obtained by the conversion in the converter portion,
   the electric power which has been outputted from said converter portion being fed to said draft motor, and the electric power which has been outputted from said chopper portion being fed to said plurality of spindle motors.

2. A system for feeding the electric power to motors for use in a textile machine according to claim 1, further comprising:

   an inverter for feeding the electric power that has been outputted from said converter portion to said draft motor, and
   a plurality of drivers for feeding the electric power that has been outputted from said chopper portion to the corresponding spindle motors.

3. A system for feeding the electric power to motors for use in a textile machine according to claim 2, wherein said converter portion comprises:

   a first converter portion for feeding the electric power to said inverter, and
   a second converter portion for feeding the electric power to said chopper portion.

4. A system for feeding the electric power to motors for use in a textile machine according to any one of claims 1 to 3, wherein said chopper portion comprises:

   a reducing chopper for reducing the voltage of the D.C. current;
   a boosting chopper for boosting the voltage of the D.C. current; and
   a controller for operating said reducing chopper in the steady running, in accordance with the fluctuation of the voltage on the load side wuich is the voltage of the electric power fed to said spindle motors, while operating said boosting chopper in the regeneration in order to maintain the voltage on the load side constant.

FIG. 1
RELATED ART

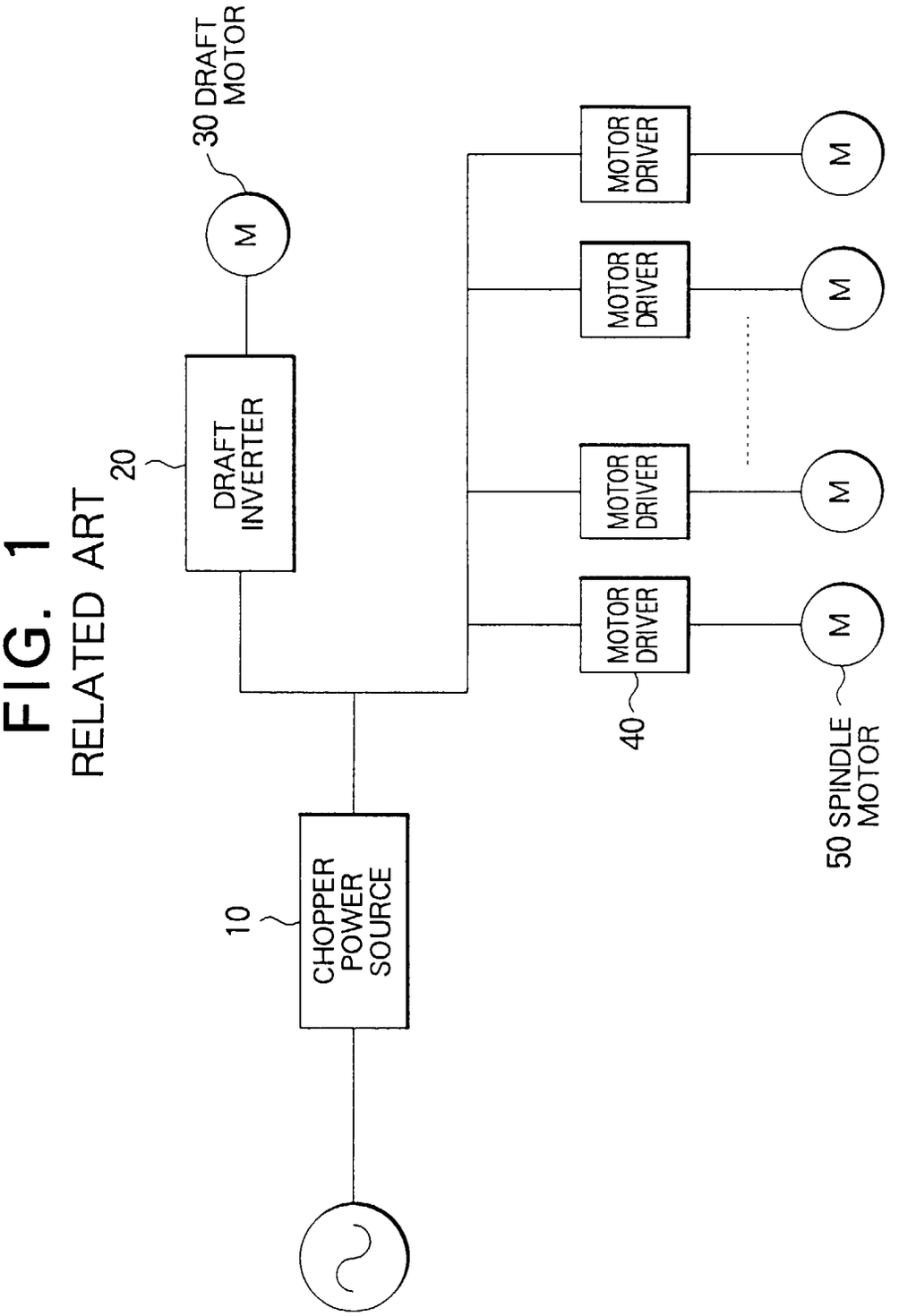
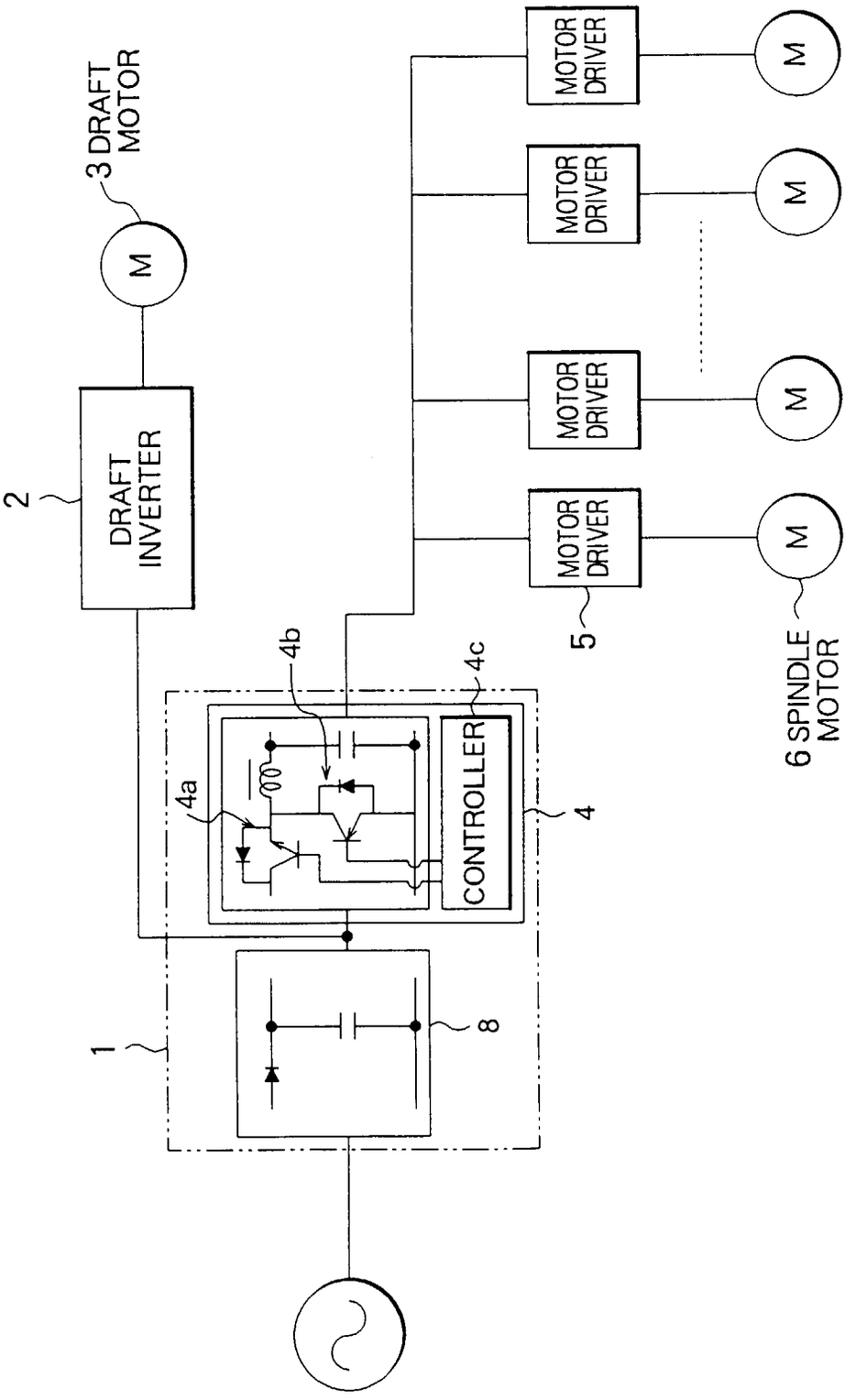


FIG. 2


3 DRAFT MOTOR
M
2
DRAFT INVERTER
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MOTOR DRIVER
MOTOR DRIVER
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5
6 SPINDLE MOTOR
4b
4c
4a
CONTROLLER
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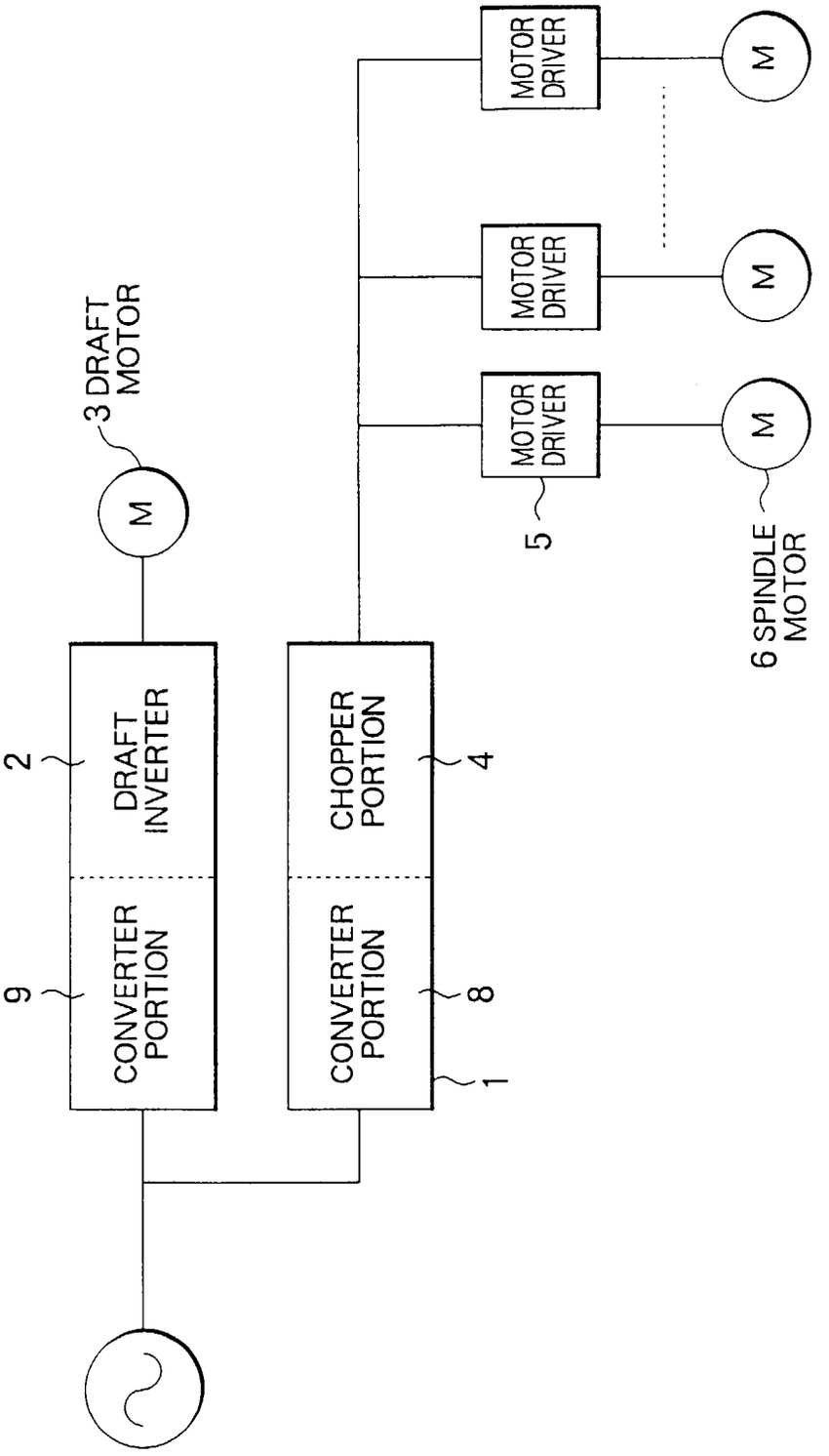
FIG. 3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MOTOR DRIVER
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6 SPINDLE MOTOR