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The present invention relates to a composable protection and control apparatus for motors, comprising a power assembly and an interchangeable control module associated with said assembly.

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Protection and control apparatus for motors, such as starting or starting-slowng down devices, associated or not with thermal protection devices, generally comprise in a case :

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- static power switches which control switching on or off of the phase currents of the motor,

- current sensors associated with at least one of the phases to be controlled,

- a control circuit for switching on - and, as required, switching off - the power switches as a function of an operating or stopping order coming, for example, from a normal command or a command for opening following an electric defect detected particularly from current intensity data delivered by the current sensors.

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Such apparatus, as, for example, the one described in the European patent 0 214 025, are sized so as to be associated with motors of given power. To provide a range

of apparatus which can be associated with a wide range of motors, the manufacturer of such apparatus must split his range into several sizes, which requires the fitting and assembly of as many separate apparatus.

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The purpose of the invention is to simplify the manufacture, storage and maintenance of protection and control apparatus for motors of the above-described type by using a control module which is common to the
10 apparatus of different sizes of a range and by appropriate arrangement of the control module and the different power assemblies to which it can be coupled.

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To achieve this result, the invention proposes a protection and control apparatus of the starting or starting-slowning down type of a multiphase motor, said
20 apparatus comprising a power assembly having semiconductor power switches controlling the switching on and off of the phase currents, as well as current sensors associated with all or part of the phases to be controlled and protected and comprising a logic for managing the control of the power switches.

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According to the invention, said apparatus is characterized in that it is formed of two modules, each comprising a casing which can be removably fixed one on the other or one in the other, one of said modules housing said power assembly, said current sensors, as well as a sizing means provided for identifying the size
30 of said power assembly, the other module, which is a standard module common to the apparatus of different sizes of a range, being connected to said current sensors and to said power switches and housing said logic, which may be connected, by means of an analog/digital
35 converter, to the sizing member and is adapted for reading the value of same and, as a function of the value read, for selecting the working characteristics of the motor corresponding to the size of the power assembly.

The manufacture, storage and maintenance of the different apparatus of the same range are therefore simplified since the same control module can be coupled to the different power assemblies of the range.

The control module advantageously comprises as logic a microprocessor which has an ROM comprising a table of the working characteristics of the apparatus.

The sizing means preferably comprises a sizing resistor with identification function. It may further comprise a resistor in the connection between the current sensors and the A-D converter, as well as a resistor associated with a thermal image safeguard means.

Other features and advantages of the invention will be clear from the following description, with reference to the accompanying drawings in which :

Figure 1 illustrates schematically a composable protection and control apparatus for motors, in accordance with the invention ;

Figure 2 shows schematically and in greater detail the apparatus of figure 1.

The apparatus shown in figure 1 is a progressive starting or starting-slowng down device for a three phase asynchronous motor.

The apparatus comprises a power assembly 10 and a control module 20. The power assembly has a case 11 on or in which is removably fixed a case 21 of the control module. The latter is a standard device common to the apparatus of different sizes - for example for motors from a few kilowatts to a few tens of kilowatts - of the same range.

Case 11 houses an assembly of static switches 12 connected on the one hand to mains terminals L1, L2, L3 and on the other to load terminals U, V, W for switching on and off the corresponding current paths L1U, L2V, L3W as a function of the signals generated by a microprocessor 22 situated in the control module.

Case 11 also houses an analog sizing means 13 connected to A-D converter inputs 23 of the microprocessor through a processing and/or matching interface 24. The connection between the sizing means 13 and the microprocessor may of course be made via an A-D converter separate from the microprocessor.

The sizing means 13 are connected to usual current sensors 14 delivering signals representative of the intensity in at least one phase conductor, in the present case in two phase conductors. Case 11 also houses a power supply 15 for feeding the members of the control module.

The control module 20 comprises, in addition to the microprocessor 22 and interface 24, a control circuit 25 for the static switches of assembly 12. In the present embodiment, the switches are thyristors whose control circuit 25 is managed by the microprocessor 22 in particular for progressive starting and slowing down of the motor, particularly as a function of desired acceleration and deceleration ramps.

The control module 20 comprises a dialog assembly 26 having input, output and signalling elements which are preferably visible and/or accessible from a front face 27 of case 21. The microprocessor 22 is connected by conductors and appropriate connection means to the sizing means 13 via the interface 24 as well as to the control circuit 25 and to the dialog assembly 26, and it is adapted so as to read the value of at least one sizing element contained in means 13 and, depending on the value

read, to choose in a table 28 (figure 2) for example in an ROM, working characteristics of the apparatus corresponding to the size of the power assembly 10.

- 5 Figure 2 relates more particularly to the sizing means 13. These means comprise three sizing elements formed very simply by resistors respectively R1, R2 and R3.

10 The sizing resistor R1 is mounted in a bridge with a fixed resistor R4 connected to a potential V^+ and is situated in the interface 24 so as to deliver to an A-D converter input 23-1 of the microprocessor an analog signal identifying the size of the power assembly 10.

15 The sizing resistor R2 is connected to a means 24a storing the thermal state of the motor, for example of the type described in the patent FR 2 586 489, so as to store this thermal state and restore it to an A-D input 23-2 of the microprocessor when requested to do so by the
20 latter, for example at the time of re-establishing the power supply after a power cut of the phases of the motor. Resistor R2 thus makes it possible to fix a time constant simulating, in a sufficiently approximate way, that of the cooling of a motor of corresponding size.

25 The sizing resistor R3 is situated in a matching circuit 16 comprising a rectifier 16a to which the current sensors 14 are connected for transmitting to a filtering and amplifying circuit 24b, provided in the interface 24,
30 a value compatible with a respective A-D input 23-3 of the microprocessor, whatever the size of the power assembly 10.

35 In addition, the control circuit 25 is formed of ignition circuits 25a and synchronization circuits 25b associated with the thyristors of assembly 12.

The dialog assembly 26 comprises, more precisely, an isolated control member 30, a removable adjusting plate 31, LEDs 32 for signalling and relay output members 33, these different elements being connected to the
5 microprocessor 22.

Claims

1. Composable protection and control apparatus of the
5 starting or starting-slowning down type for a multiphase
motor, said apparatus having a power assembly (10)
comprising semiconductor power switches (12) controlling
the switching on and off of the phase currents, as well
as current sensors (14) associated with all or part of
10 the phases to be controlled and protected, and a logic
(22) which manages the control of the power switches
(12),
characterized in that it is formed of two modules, each
having a case (11, 21) which may be removably fixed one
15 on the other or one in the other, one of said modules
housing said power assembly (10), said current sensors
(14), as well as a sizing means (13) for identifying the
size of said power assembly (10), the other module (20),
20 which is a standard module common to the apparatus of
different sizes of a range, being connected to said
current sensors (14) and said power switches (12) and
housing said logic (22) which may be connected by means
of an A-D converter to the sizing means (13) and is
25 adapted for reading the value thereof and, as a function
of the value read, for selecting the working
characteristics of the motor corresponding to the size of
the power assembly (10).
2. The apparatus as claimed in claim 1,
30 characterized in that said logic (22) of the control
module (20) is a microprocessor which has an ROM
comprising a table (28) of the working characteristics of
the apparatus.
- 35 3. The apparatus as claimed in claim 1,
characterized in that said sizing means comprises a
resistor (R1).



4. The apparatus as claimed in claim 1,
characterized in that said current sensors (14) belonging
to the power assembly (10) are connected to the A-D
converter of the control module (20) by a matching
5 circuit (16) belonging to the power assembly and having a
sizing element such as a resistor (R3).

5. The apparatus as claimed in claim 1,
characterized in that a sizing element such as a resistor
10 (R2) belonging to the power assembly (10) is connected to
a thermal image safeguard means (24a) situated in the
control module (20) and managed by said logic (22).

