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RIDOUT & MAYBEE LLP
225 King Street West
10TH Floor
TORONTO Ontario
M5V 3M2

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AVIS D'ACCEPTATION/NOTICE OF ALLOWANCE

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Votre référence/ Your Reference : 46343-0023 RHW:aj

Titre de l'invention/ Title of Invention : CENTRAL VACUUM CLEANING SYSTEM CONTROL SUBSYSTEMS

Propriétaire(s)/Owner(s) : CUBE INVESTMENTS LIMITED

Revendications/Claims : 051

Examiné tel que modifié/ Examined as amended : 2012/02/06

La demande de brevet susmentionnée a été jugée acceptable.

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The above application for patent has been found allowable..

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An additional fee of six dollars ($6.00) per page over 100 pages of specification and drawings must also be paid.

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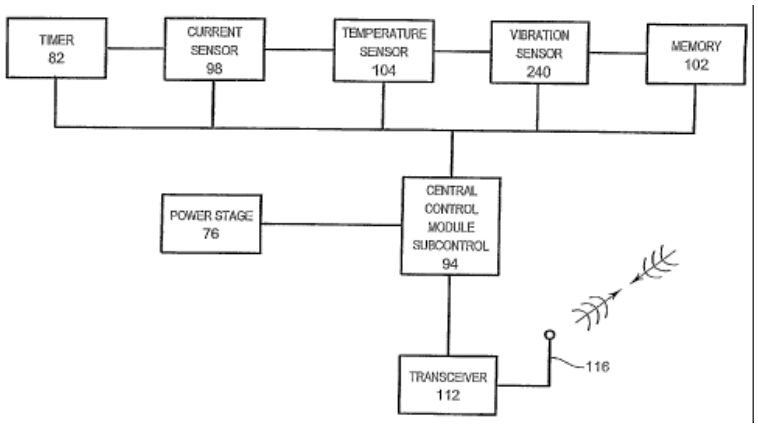
Patent Summary

(12) Patent:	(11) **CA 2566020**
(54) English Title:	CENTRAL VACUUM CLEANING SYSTEM CONTROL SUBSYSTEMS
(54) French Title:	SOUS-SYSTEME DE COMMANDE D'UN SYSTEME CENTRAL DE NETTOYAGE PAR ASPIRATION

Representative Drawing



Abstracts

English Abstract

A central vacuum cleaning system control subsystem for use in a central vacuum cleaning system having a motor includes a central vacuum unit control module with a receiver for wirelessly receiving command signals, and a power stage for controlling the motor in accordance with command signals received through the receiver. The control module is stable in high ambient temperature. Current flowing to the motor is sensed, and motor overcurrent and undercurrent conditions are determined. The control module determines when the motor is in an overcurrent condition. Power stage has a triac for controlling power to the motor. The control module also has a microprocessor that compares the current sensed against a normal operating current to determine overcurrent condition. Power to motor ceases when overcurrent condition exists. A generator is powered by air flow in a cleaning system for production of electrical energy.

French Abstract

L'invention porte sur le sous-système de commande d'un système central de nettoyage par aspiration motorisé comportant un module de commande muni d'un récepteur de signaux sans fil et d'un régulateur de la puissance du moteur, en fonction d'instructions transmises au récepteur. Le module de commande reste stable dans des températures ambiantes élevées. Le courant traversant le moteur est détecté et on détermine les conditions de surintensité ou de sous-intensité. Le module de commande détermine quand le moteur est dans des conditions de surintensité, et le régulateur de puissance comporte un triac régulant le courant d'alimentation du moteur. Le module de commande comporte également un microprocesseur comparant le courant détecté au courant de fonctionnement normal pour détecter les conditions de surintensité. L'alimentation du moteur cesse en cas de surintensité. L'invention porte également sur un générateur d'énergie électrique commandant le flux d'air d'un système de nettoyage.

Patent Details

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(72) Inventors (Country):	**CUNNINGHAM, J. VERN** (Canada)

(73) Owners (Country):	**CUBE INVESTMENTS LIMITED** (Canada)
(71) Applicants (Country):	**CUBE INVESTMENTS LIMITED** (Canada)
(74) Agent:	**RIDOUT & MAYBEE LLP**
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Last Updated: 2012-11-13

I claim:

1. A central vacuum cleaning system comprising:

a) a line power input;

b) a vacuum unit comprising a dirt collection unit;

c) at least one dirty air intake conduit defining an airflow path to the vacuum unit and terminating in the dirt collection unit;

d) a vacuum motor adapted to generate a working airflow from the dirty air intake conduit to the dirt collection unit; and

e) a programmable control unit comprising a power conditioning module and adapted to be programmed with a control program that controls provision of the power conditioning module to provide power from the line power input to drive the vacuum motor, and

f) a user interface in communication with the programmable control unit to output status information during operation of the central vacuum cleaning system based on an operating condition of the vacuum motor selected from the group consisting of: temperature, vibration and current, and

wherein the dirt collection unit, and the vacuum motor are located in the vacuum unit and the programmable control unit is operatively connected to the vacuum motor.

2. The central vacuum cleaning system according to claim 1, wherein the power conditioning module is controlled by the programmable control unit to deliver power to the vacuum motor.

3. The central vacuum cleaning system according to any one of claims 1 or 2, wherein the programmable control unit is located in the vacuum unit

4. The central vacuum cleaning system according to any one of claims 1 to 3, wherein the control program is stored in a memory structure in the programmable control unit.

5. The central vacuum cleaning system according to any one of claims 1 to 4, wherein the programmable control unit comprises a memory structure and the programmable control unit is adapted to record operational data relating to operation of the central vacuum cleaner system in the memory structure.

6. The central vacuum cleaning system according to claim 5, wherein the operational data comprises measured motor current levels.

7. The central vacuum cleaning system according to any one of claims 1 to 6, wherein the programmable control unit further comprises a service tool interface.

8. The central vacuum cleaning system according to claim 7, wherein the service tool interface comprises an interface selected from the group consisting of a connector, a wireless interface and combinations thereof.

9. The central vacuum cleaning system according to claim 7, wherein the service tool interface comprises an interface comprising a wireless interface.

10. The central vacuum cleaning system according to any one of claims 1 to 9, wherein the programmable control unit is further adapted to execute a power shut off if at least one error condition is detected from the group consisting of a detected locked motor rotor, a detected current level exceeding a predetermined threshold, a detected temperature exceeding a predetermined threshold, a period of continuous vacuum motor operation exceeding a predetermined threshold, and combinations thereof.

11. The central vacuum cleaning system according to any one of claims 1 to 10, further comprising a remote user interface in communication with the programmable control unit and adapted to permit a user of the system to restart the central vacuum cleaner system after a power shut off event.

12. The central vacuum cleaning system according to claim 1, wherein the programmable control unit comprises a microprocessor-based printed circuit board (PCB).

13. The central vacuum cleaning system according to any one of claims 1 to 12, wherein the user interface is adapted to receive user inputs.

14. The central vacuum cleaning system according to any one of claims 1 to 13 wherein the programmable control unit further comprises a current sensor operatively connected to sense current drawn by the motor, and the user interface output status information based on the operating condition of the motor is further based on the current drawn by the motor sensed by the current sensor.

15. The central vacuum cleaning system according to any one of claims 1 to 14, wherein the user interface comprises an indicator panel with one or more status indicators.

16. The central vacuum cleaning system according to any one of claims 1 to 15, wherein the programmable control unit is further adapted to output status information comprising one or more error conditions selected from the group consisting of a detected locked motor rotor, a detected current level exceeding a predetermined threshold, a detected temperature exceeding a predetermined threshold, a period of continuous vacuum motor operation exceeding a predetermined threshold, and combinations thereof.

17. The central vacuum cleaning system according to claim 16, wherein the error condition is a detected locked motor rotor.

18. The central vacuum cleaning system according to claim 16, wherein the error condition is a detected current level exceeding a predetermined threshold.

19. The central vacuum cleaning system according to claim 16, wherein the error condition is a detected temperature exceeding a predetermined threshold.

20. The central vacuum cleaning system according to claim 16, wherein the error condition is a period of continuous vacuum motor operation exceeding a predetermined threshold.

21. The central vacuum cleaning system according to any one of claims 1 to 20, wherein the programmable control unit is further adapted to output status information comprising an error condition of a detected undercurrent level.

22. The central vacuum cleaner system according to any one of claims 10, 16 to 18, and 20 to 21, wherein the programmable control unit is further adapted to determine the error condition based on current drawn by the motor.

23. The system of claims 1 to 22 wherein the user interface is located on a hose handle.

24. The system of any one of claims 1 to 22 wherein the user interface is located at a remote station apart from the vacuum source and a vacuum handle.

25. The system of claims 1 to 24 wherein the user interface comprises an LCD screen.

26. The system of claims 1 to 25 wherein the user interface comprises a multiple colour light source.

27. The system of claim 26 wherein the multiple colour light source comprises multiple single colour LED light sources.

28. The system of claim 26 wherein the multiple colour light source comprises a multi-colour LED.

29. The central vacuum cleaning system according to any one of claims 1 to 28, wherein the

programmable control unit is further adapted to control provision of the power conditioning module to vary the power provided to the vacuum motor so as to vary the working airflow generated by the vacuum motor.

30. The central vacuum cleaning system of any one of claims 1 to 28, wherein the programmable control unit is further adapted to control provision of the power conditioning module to vary the power provided to the vacuum motor so as to vary the working airflow generated by the vacuum motor, and wherein the programmable control unit is adapted to vary the working airflow generated by the vacuum motor in response to user input from the user interface.

31. The central vacuum cleaning system according to any one of claims 29 to 30, wherein the programmable control unit is adapted to vary the working air flow by varying the operating speed of the vacuum motor.

32. The central vacuum cleaning system according to any one of claims 29 to 31, wherein the programmable control unit is adapted to vary the power by varying the voltage seen by the motor.

33. The central vacuum cleaning system of any one of claims 29-32, wherein the programmable control unit varies the power provided to the vacuum motor by phase control.

34. The central vacuum cleaning system according to of any one of claims 29 to 33, wherein the power conditioning module comprises a triac and the power provided to the vacuum motor is varied by controlling the triac.

35. The central vacuum cleaning system according to any one of claims 1 to 34, wherein the programmable control unit further comprises an autodialer to communicate information about the central vacuum cleaning system with a remote location.

36. The central vacuum cleaning system according to claim 35, wherein the programmable

control unit is configured to communicate information with the remote location in response to a predetermined condition.

37. The central vacuum cleaning system according to claim 35, wherein the programmable control unit is configured to communicate information to the remote location in response to an inquiry from the remote location.

38. The system of any one of claims 1 to 34 wherein the user interface further comprises:

display means at a location remote from the vacuum unit, and

input means, and

the system further comprises duplex communication means to provide control signals from the input means to the programmable control unit and to receive at the remote location from the programmable control unit a plurality of messages regarding the status of the system, such information to drive the display means for communication with an operator.

39. The system of claim 38 wherein the duplex communications means comprises low voltage wires between the display means and the programmable control unit.

40. The system according to any one of claims 38 to 39 wherein the duplex communications means comprises low voltage wires between the input means and the programmable control unit.

41. The system of claim 38 wherein the duplex communications means comprises a RF wireless receiver at the remote location through which the user interface receives the messages and a RF wireless transmitter through which the programmable control unit transmits the messages.

42. The system according to any one of claims 38, 39 and 41 wherein the duplex communications means comprises a RF wireless transmitter through which the input means transmits control signals and a RF wireless receiver through which the programmable control unit receives the control signals.

43. The system of claim 38 wherein the input means and the display means are located on the handle, and the duplex communications means comprises an RF wireless receiver and RF wireless transmitter in the handle for transmitting control signals and receiving the messages, and a RF wireless transmitter and RF wireless receiver through which the programmable control unit transmits the messages and receives the control signals.

44. The system of any one of claims 1 to 14 wherein the user interface further comprising:

display means adapted to provide a plurality of different messages to a user regarding the status of the system,

wherein the display means is driven by messages from the programmable control unit to provide the messages to the user.

45. The central vacuum cleaning system according to any one of claims 1 to 44 comprising:

valves to which a flexible hose can be connected,

a handle to be held by an operator, the hose terminating at the handle, and

a cleaning attachment connected to the handle,

wherein the at least one dirty air intake conduit is operatively connected to the valves such the working airflow is generated by a vacuum created by the vacuum source through the attachment, the handle, the hose, a valve connected to the hose, and the conduit to the dirt collection unit.

46. A method of operating a central vacuum cleaning system comprising:

a) controlling, using a programmable control unit having a power conditioning module, provision of power from a line power input to drive a vacuum motor in a vacuum unit to generate a working airflow from a dirty air intake conduit to a dirt collection unit in the

vacuum unit, and

b) outputting status information based on at least one operating condition of the vacuum motor. to a user interface in communication with the programmable control unit during operation of the central vacuum cleaning system, wherein the at least one operating condition of the vacuum motor is selected from the group consisting of: temperature, vibration, and current.

47. The method of claim 46 further comprising: receiving user inputs to the programmable control unit, and wherein controlling using the programmable control unit to control provision of power further comprises controlling based on the received user inputs.

48. The method of any one of claims 46 and 47 further comprising: sensing the current drawn by the vacuum motor, and wherein outputting status information based on at least one operating condition of the vacuum motor further comprises outputting such status information further based on the sensed current drawn by the vacuum motor.

49. The method of any one of claims 46 to 48 wherein outputting status information based on at least one operating condition of the vacuum motor further comprises outputting such status information comprising an error condition selected from the group consisting of a detected locked motor rotor, a detected current level exceeding a predetermined threshold, a detected temperature exceeding a predetermined threshold, a period of continuous vacuum motor operation exceeding a predetermined threshold, and combinations thereof.

50. The method of any one of claims 46 to 49 further comprising generating the working airflow through valves operatively connected to the dirty air intake conduit, a handle to be held by an operator, a flexible hose connected to a valve and terminating at the handle, a cleaning attachment connected to the handle.

51. A method of operating a central vacuum cleaning system comprising:

a) controlling, using a programmable control unit having a power conditioning module,

provision of power from a line power input to drive a vacuum motor in a vacuum unit to generate a working airflow from a dirty air intake conduit to a dirt collection unit in the vacuum unit, and

b) providing input control signals to the programmable control unit and receiving at a location remote to the vacuum unit a plurality of messages from the programmable control unit regarding the status of the system based on at least one operating condition of the vacuum motor, wherein the at least one operating condition of the vacuum motor is selected from the group consisting of: temperature, vibration, and current and

c) displaying messages regarding the status of the system to a user based on the received messages from the programmable control unit.