CLAIMS

1. A respiratory support apparatus that is configured to provide a flow of gases to a user for respiratory therapy comprising:

a flow generator that is operable to generate a flow of gases;

a controller that is operatively connected to the flow generator and operable to control a flow rate of the flow of gases by controlling a motor speed of the flow generator, wherein the controller is configured to:

receive an input that represents a set flow rate at which the apparatus is to generate the flow of gases for a desired therapy session;

predict if a steady-state temperature of the apparatus will exceed a high-temperature-condition threshold, based at least partly on a motor speed required to generate the set flow rate; and

generate a predicted-high-temperature-condition signal if the high-temperature-condition threshold is exceeded based on the prediction.

2. A respiratory support apparatus according to claim 1 wherein predicting if the steady-state temperature will exceed the high-temperature-condition threshold is based on determining if the required motor speed exceeds a maximum allowable motor speed, wherein the maximum allowable motor speed represents the highest motor speed, for the set flow rate, that the apparatus can sustain without the steady-state temperature exceeding the high-temperature-condition threshold.

3. A respiratory support apparatus according to claim 2 wherein the maximum allowable motor speed is based on, or is a function of, a predetermined heat model, and wherein:

the heat model represents the heat generated by the flow generator, which is a function of the flow rate and the motor speed; or

the heat model represents the heat generated by the flow generator, which is a function of the flow rate and the motor speed, and one or more non-flow generator heat sources.

4. A respiratory support apparatus according to claim 3 wherein the heat model is configured to represent the one or more non-flow generator heat sources with respective preset values representing an estimate of the maximum heat that could be generated by each of the one or more non-flow generator heat sources during operation.

5. A respiratory support apparatus according to claim 1 wherein predicting if the steady-state temperature will exceed the high-temperature-condition threshold is based on:

predicting the steady-state temperature as a function of the required motor speed and set flow rate; and

determining if the predicted steady-state temperature exceeds the high-temperature-condition threshold, and wherein predicting the steady-state temperature comprises determining an estimate from a predetermined heat model.

6. A respiratory support apparatus according to claim 1 wherein the controller is configured to predict if the steady-state temperature of the apparatus will exceed the high-temperature-condition threshold by:

determining if the required motor speed exceeds a maximum allowable motor speed for the set flow rate, the maximum allowable motor speed representing the high-temperature-condition threshold, and wherein the maximum allowable motor speed for the set flow rate is determined based on, or is a function of, a predetermined heat model.

7. A respiratory support apparatus according to claim 1 wherein the controller is configured to predict if the steady-state temperature of the apparatus will exceed the high-temperature-condition threshold by:

predicting the steady-state temperature based on, or as a function of, a predetermined heat model, the set flow rate, and the required motor speed; and

determining if the predicted steady-state temperature exceeds the high-temperature-condition threshold.

8. A respiratory support apparatus according to claim 7 wherein the heat model generates a temperature variable representing the predicted steady-state temperature based at least on the set flow rate, the required motor speed, and one or more other

parameters representing non-flow generator heat-sources of or associated with the apparatus that will contribute to the steady-state temperature of the apparatus.

9. A respiratory support apparatus according to any one of claims 3-8 wherein the heat model represents one or more heat sources of or associated with the apparatus, including at least representing the heat generated by the flow generator as a function of motor speed and flow rate, and wherein the heat model further represents the heat generated by one or more non-flow generator heat sources of or associated with the apparatus that will contribute to the steady-state temperature of the apparatus.

10. A respiratory support apparatus according to any one of claims 1-9 wherein the controller is configured to receive the set flow rate input for the desired therapy session when the apparatus is at start-up or standby with the flow generator stopped or idling at a non-therapy speed prior to the desired therapy session beginning; and/or wherein the controller is configured to receive the set flow rate input while the apparatus is already operating in a current therapy session at a first flow rate, and the set flow rate input is a different second flow rate relating to the new desired therapy session.

11. A respiratory support apparatus according to claim 1 wherein the controller is configured to predict if the steady-state temperature of the apparatus will exceed the high-temperature-condition threshold based at least partly on the required motor speed by:

estimating a first heat value representing the heat contributing to the steady-state temperature by one or more non-flow generator heat sources;

estimating a maximum allowable motor speed of the flow generator corresponding to a second heat value representing the heat contributing to the steady-state temperature by the flow generator such that the aggregate of the first heat value and second heat value do not cause the steady-state temperature to exceed the high-temperature-condition threshold;

increasing or changing the motor speed of the flow generator to the motor speed required for the flow generator to generate the set flow rate so as to thereby determine the required motor speed for that set flow rate; and

predicting that the steady-state temperature of the apparatus will exceed the high-temperature-condition threshold if the determined required motor speed is above the estimated maximum allowable motor speed.

12. A respiratory support apparatus according to claim 1 wherein the controller is configured to predict if the steady-state temperature of the apparatus will exceed a high-temperature-condition threshold based at least partly on the required motor speed by:

increasing or changing the motor speed of the flow generator to the motor speed required for the flow generator to generate the set flow rate so as to thereby determine the required motor speed for that set flow rate;

estimating a first steady-state temperature value representing the heat contributed to the steady-state temperate by the flow generator;

estimating a second steady-state temperature value representing the heat contributed to the steady-state temperature by one or more non-flow generator heat sources;

predicting the steady-state temperature of the apparatus by aggregating the first steady-state temperature value and second steady-state temperature value; and

evaluating if the predicted steady-state temperature exceeds the high-temperature-condition threshold.

13. A respiratory support apparatus according to any one of claims 3, 4, 8, 9, 11, or 12 wherein the one or more non-flow generator heat sources comprise any one or more of the following non-flow generator components or variables of, connected to, or associated with the apparatus: ambient temperature of environment surrounding apparatus, a battery or power source, a heater plate of a humidifier, a heater wire of a patient interface conduit, electronic circuitry or components, a Printed Circuit Board (PCB), a graphical user interface, and/or a display screen.

14. A respiratory support apparatus according to any one of claims 1-13 wherein the steady-state temperature is configurable to represent any predictable temperature of interest of, within, or associated with the apparatus; and/or wherein the steady-state temperature represents a sustained and/or stable temperature parameter, as opposed to a

transient temperature parameter; and/or wherein the steady-state temperature represents a predicted temperature parameter after the apparatus has been operating in the desired therapy session for at least a predetermined minimum time period at the set flow rate such that the steady-state temperature represents a sustained and/or stable temperature parameter.

15. A respiratory support apparatus according to any one of claims 1-14 wherein the steady-state temperature of the apparatus represents the predicted temperature of the flow of gases in the apparatus at a specified region or location within a gases flow path of the apparatus; and/or wherein the steady-state temperature of the apparatus represents the predicted temperature within a specific location or region of a main housing of the apparatus; and/or wherein the steady-state temperature of the apparatus represents the predicted temperature at or in the region of a specific component or componentry of the respiratory support apparatus; and/or wherein the steady-state temperature of the apparatus represents a predicted generic overall temperature parameter associated with the apparatus based on a heat model of the apparatus and/or one or more heat sources of interest of or associated with the apparatus.

16. A respiratory support apparatus according to any one of claims 1-15 wherein the high-temperature-condition threshold is a temperature parameter that is predetermined or selected based on the characteristics of the apparatus and/or the specific type of steady-state temperature being predicted.

17. A respiratory support apparatus according to claim 16 wherein the steady-state temperature represents a predicted temperature parameter relating to the temperature of flow of gases at a specified region or location within the apparatus, and the high-temperature-condition threshold is configured to represent a gases temperature safety threshold or value above which there is an increased risk of faulty operation, damage to the apparatus, and/or a safety risk to the user; and/or wherein the steady-state temperature represents a predicted temperature parameter relating to a specific location or region of a main housing of the apparatus, and the high-temperature-condition threshold is configured to represent a housing temperature safety threshold or value above which there

is an increased risk of faulty operation, damage to the apparatus, and/or a safety risk to the user.

18. A respiratory support apparatus according to any one of claims 1-17 wherein the controller is configured to generate an alarm if a predicted-high-temperature-condition signal is generated, and wherein:

the alarm comprises any one of more of the following types of alarms: audible, visual, tactile, and/or haptic; and/or

the alarm comprises an alarm message or indication on a display screen or a user interface of the apparatus.

19. A respiratory support apparatus according to claim 18 wherein the controller is configured to reject the set flow rate and disable the motor or reduce the motor to an idling speed if the alarm is generated; or wherein the controller is configured to cap the motor speed to a maximum allowable motor speed and to generate an alarm message or indication on a display screen or a user interface of the apparatus if an alarm is generated, and wherein the maximum allowable motor speed represents the highest motor speed, for the set flow rate, that the apparatus can sustain without the steady-state temperature exceeding the high-temperature-condition threshold.

20. A respiratory support apparatus according to any one of claims 1-19 wherein the flow generator comprises one or more thermistors located within the housing of the flow generator or in thermal communication with the flow generator or a motor of the flow generator, and wherein the thermistor(s) are configured to sense a temperature of or relating to the flow generator and/or motor of the flow generator, and generate representative temperature signal(s).

21. A method of controlling a respiratory support apparatus that is configured to provide a flow of gases to a user for respiratory therapy, the apparatus comprising: a flow generator that is operable to generate a flow of gases; a controller that is operatively connected to the flow generator and operable to control a flow rate of the flow of gases by controlling a motor speed of the flow generator, wherein the method is executable or implemented by the controller and comprises:

receiving an input that represents a set flow rate at which the apparatus is to generate the flow of gases for a desired therapy session;

predicting if a steady-state temperature of the apparatus will exceed a high-temperature-condition threshold, based at least partly on a motor speed required to generate the set flow rate; and

generating a predicted-high-temperature-condition signal if the high-temperature-condition threshold is exceeded based on the prediction.