We claim:

1. An inhalation device for delivering medication from a container through a flow channel to a patient, said inhalation device comprising:

an electrically driven vibratory element;

a controller for activating/deactivating the vibratory element; and

a sensor arrangement system comprising a first sensor physically arranged to face inhalation air to generate an inhalation flow signal and a second sensor physically arranged to face exhalation air to generate an exhalation flow signal,

wherein the controller is adapted to process the inhalation flow signal and exhalation flow signal to generate a trigger signal for controlling the timing of operation of the vibratory element.

2. An inhalation device as claimed in claim 1, wherein the container comprises a blister pack, wherein the device comprises a blister advance mechanism.

3. The inhalation device as claimed in claim 1 or 2, wherein the first sensor and the second sensor each comprise thermistor sensors.

4. The inhalation device as claimed in claim 3, wherein the first sensor and the second sensor are biased with constant current so as to maintain a temperature higher than ambient.

5. The inhalation device as claimed in claim 4, wherein the thermistors are biased with a constant current so as to maintain a temperature higher than about 50°C.

6. The inhalation device as claimed in any preceding claim, wherein the controller comprises:

a circuit or processor for combining signals from the first and second sensors to generate a direction signal that indicates direction of air flow; and

a circuit or processor for processing a signal from the first sensor to generate a flow signal proportional to air flow.

7. The inhalation device as claimed in claim 6, wherein the controller further comprises a circuit or processor for processing a signal from the first sensor to generate a signal indicating an operating temperature.

8. The inhalation device as claimed in claim 6 or 7, wherein the controller further comprises a circuit or processor for processing the flow signal and direction signals to generate respective baseline signals and to provide baseline-corrected flow signal and direction signals.

9. The inhalation device as claimed in claim 8, wherein the controller is adapted to process the baseline-correct flow signal and baseline-corrected direction signal to generate a flow function, and to generate the trigger signal from the flow function.

10. The inhalation device as claimed in any preceding claim, wherein the vibratory element comprises a piezo electric vibrator.

11. A method of controlling an inhalation device for delivering medication from a container through a flow channel to a patient, the method comprising:

using a first sensor facing inhalation air to generate an inhalation flow signal;

using a second sensor facing exhalation air to generate an exhalation flow signal;

processing the inhalation flow signal and exhalation flow signal to generate a trigger signal for controlling the timing of operation of an electrically driven vibratory element for releasing the medication into the flow channel.

12. A method as claimed in claim 11, wherein generating an inhalation flow signal and generating an exhalation flow signal each comprises measuring a degree of cooling of a thermistor sensor, and the method comprises biasing the thermistors with a constant current so as to maintain a temperature higher than ambient.

13. A method as claimed in claim 11 or 12, comprising:

combining signals from the first and second sensors to generate a direction signal that indicates direction of air flow;

processing the signal from the first sensor to generate a flow signal proportional to air flow; and

generating from the flow signal a signal indicating an operating temperature.

14. A method as claimed in claim 13, comprising processing the direction signal and the flow signal to generate respective baseline signals, and adapting the direction signal and the flow signal to provide a baseline-corrected direction signal and a baseline-corrected flow signal.

15. A method as claimed in claim 14, further comprising:

obtaining a derivative signal which is the derivative with respect to time of the baseline-corrected direction signal; and

creating a polynomial function which represents the air flow through the flow channel which has a term comprising a multiple of the baseline-corrected direction signal, a term comprising a multiple of the baseline-corrected flow signal, and a term comprising a multiple of the derivative signal.

16. A method as claimed in claim 15, further comprising deriving the trigger signal from the polynomial function, wherein the trigger signal is for:

Initiating a dose advance function when a first valid inhalation has been detected following wake-up of the inhaler; or

activate the vibratory element to deliver a burst of medication powder when the trigger follows a dose advance and throughout a dosing session.

17. A computer readable medium comprising computer program code means adapted to perform a method of controlling an inhalation device for delivering medication from a container through a flow channel to a patient, the method comprising:

obtaining a signal from a first sensor facing inhalation air to generate an inhalation flow signal;

obtaining a signal from a second sensor facing exhalation air to generate an exhalation flow signal,

processing the inhalation flow signal and exhalation flow signal to generate a trigger signal for controlling the timing of operation of an electrically driven vibratory element for releasing the medication into the flow channel.

18. A computer readable medium as claimed in claim 17, adapted to perform the steps of:

combining the signals from the first and second sensors to generate a direction signal that indicates direction of air flow;

processing the signal from the first sensor to generate a flow signal proportional to air flow; and

generating from the flow signal a signal indicating an operating temperature.

19. A computer readable medium as claimed in claim 18, adapted to perform the steps of processing the direction signal and the flow signal to generate respective baseline signals, and adapting the direction signal and the

flow signal to provide a baseline-corrected direction signal and a baseline-corrected flow signals.

20. A computer readable medium as claimed in claim 19, adapted to perform the steps of:

obtaining a derivative signal which is the derivative with respect to time of the baseline-corrected direction signal;

creating a polynomial function which represents the air flow through the flow channel which has a term comprising a multiple of the baseline-corrected direction signal, a term comprising a multiple of the baseline-corrected flow signal, and a term comprising a multiple of the derivative signal; and

deriving the trigger signal from the polynomial function.

We claim:

1. An inhalation device for delivering medication from a container through a flow channel to a patient, said inhalation device comprising:

an electrically driven vibratory element;

a blister pack advancement mechanism;

a controller configured to activate and deactivate the vibratory element; and

a sensor arrangement system configured to generate signals indicative of inhalation,

wherein the controller is configured to process the signals indicative of inhalation, determine that a first inhalation flow signal is above a threshold and generate a first trigger signal for advancing the blister pack advancement mechanism based on the first inhalation flow signal being above the threshold, and determine that a second inhalation flow signal is above the threshold and generate a second trigger signal for controlling a timing of operation of the vibratory element for releasing medication into the flow channel based on the second inhalation flow signal being above the threshold.

2. An inhalation device as claimed in claim 1, wherein the controller is configured to, after the controller transitioning from a sleep state to an on state, generate the first trigger signal for advancing the blister advancement mechanism based on the first inhalation flow signal being above the threshold.

3. The inhalation device as claimed in claim 1, wherein the sensor arrangement system comprises a first sensor physically arranged to face inhalation air and a second sensor physically arranged to face exhalation air, and wherein the first sensor and the second sensor each comprise thermistor sensors.

4. The inhalation device as claimed in claim 1, wherein the controller is configured to determine that a preliminary inhalation flow signal is above the threshold, and wherein the preliminary inhalation flow signal is determined prior to the first inhalation flow signal, and the first inhalation flow signal is determined prior to the second inhalation flow signal.

5. The inhalation device as claimed in claim 4, wherein the preliminary inhalation flow signal, the first inhalation flow signal, and the second inhalation flow signal are determined based on consecutive inhalations.

6. The inhalation device as claimed in claim 1, wherein the controller is configured to determine the first inhalation flow signal from a first signal indicative of inhalation from the sensor arrangement system, and determine the second inhalation flow signal from a second signal indicative of inhalation from the sensor arrangement system.

7. The inhalation device as claimed in claim 1, wherein the controller is configured to generate the second trigger signal only after a plurality of consecutive inhalation flow signals are determined to be above the threshold.

8. The inhalation device as claimed in claim 1, wherein the controller is configured to determine that an intermediate inhalation flow signal is below the threshold and suspend a dosing procedure based on the intermediate inhalation flow signal being below the threshold.

9. The inhalation device as claimed in claim 1, wherein the controller is configured to generate the second trigger signal for controlling the timing of operation of the vibratory element based on the second inhalation flow signal being above the threshold and subsequent to generating the first trigger signal.

10. The inhalation device as claimed in any preceding claim, wherein the vibratory element comprises a piezo electric vibrator.

11. A method of controlling an inhalation device for delivering medication from a container through a flow channel to a patient, the method comprising:

receiving signals indicative of inhalation from a sensor arrangement system;

determining that a first inhalation flow signal is above a threshold;

generating a first trigger signal for advancing a blister pack advancement mechanism based on the first inhalation flow signal being above the threshold;

determining that a second inhalation flow signal is above the threshold;

generating a second trigger signal for controlling a timing of operation of an electrically driven vibratory element for releasing the medication into the flow channel based on the second inhalation flow signal being above the threshold.

12. A method as claimed in claim 11, further comprising determining the first inhalation flow signal from a first signal indicative of inhalation from the sensor arrangement system, and determining the second inhalation flow signal from a second signal indicative of inhalation from the sensor arrangement system.

13. A method as claimed in claim 11, further comprising, after the controller transitions from a sleep state to an on state, generating the first trigger signal for advancing the blister pack advancement mechanism based on the first inhalation flow signal being above the threshold.

14. A method as claimed in claim 11, further comprising determining that a preliminary inhalation flow signal is above the threshold, and wherein the preliminary inhalation flow signal is determined prior to the first inhalation flow signal, and the first inhalation flow signal is determined prior to the second inhalation flow signal.

15. A method as claimed in claim 14, wherein the preliminary inhalation flow signal, the first inhalation flow signal, and the second inhalation flow signal are determined based on consecutive inhalations.

16. A method as claimed in claim 11, further comprising generating the second trigger signal only after a plurality of consecutive inhalation flow signals are determined to be above the threshold.

17. The method of claim 11, further comprising determining that an intermediate inhalation flow signal is below the threshold, and suspending a dosing

procedure based on the intermediate inhalation flow signal being below the threshold.

18. The method of claim 11, wherein the sensor arrangement system comprises a first sensor physically arranged to face inhalation air and a second sensor physically arranged to face exhalation air, and wherein the first sensor and the second sensor each comprise thermistor sensors.

19. The method of claim 11, further comprising generating the second trigger signal for controlling the timing of operation of the vibratory element based on the second inhalation flow signal being above the threshold and subsequent to generating the first trigger signal.

20. The method of claim 11, wherein the vibratory element comprises a piezo electric vibrator.