[0021] Figure 14 shows the system of Figure 13 when the system is flushing the breathing signal sensor path.

[0022] Figure 15 shows the system of Figure 13 when the system is flushing the bypass path of the analyte measurement path.

[0023] Figure 16 shows the system of Figure 13 when the system is moving the analyte gas sample from the analyte pathway to the analyte sensor.

Detailed Description

[0024] In Figure 1 the overall system is described, which includes a patient interface C and instrument M. In the case described, the patient interface is a nasal cannula, however other types of patient interfaces and sampling cannula can be used, such as oral cannula, tracheal cannula, bronchial cannula, mouthpieces, mainstream collection adaptors, masks, and others. The cannula includes a nosepiece NP, a nasal prong P, a fluid flow path tube T1 on one side, and a non-flow path tube T2 on the other side to help hold the cannula to the face, and a connector C1 to connect to the instrument M. The connector includes a filter F1 or filters to filter humidity and bacteria from the patient which would otherwise harm the instrument and sensors. The instrument includes an inlet connector C2 for cannula attachment, an inlet value V1 to switch between gas from an ambient inlet amb and patient inlet Pt, a filter at the ambient inlet F2, a breathing pattern sensor S1 to query the breathing pattern of the gas from the patient, a sample tube 10 to contain the sample which is to be analyzed, an inlet and outlet valve V2 and V3 respectively to the sample tube, a bypass tube 12 to divert other gases around the gas sample in the sample tube, a push tube 14 to push the gas in the sample tube to the gas composition sensor S2, a pump P to draw the sample from the patient and optionally to push the sample to the gas composition sensor, a pump outlet filter F3 to protect the system from particulate stemming from the pump, a gas composition sensor S2, a valve V4 to control whether the pump is drawing from the patient or pushing the sample to the gas composition sensor. The instrument may include a battery B for operation, a microprocessor uP for control functions and other functions, and a user interface UI.

[0025] In Figure 1a the instrument's gas flow path "a" is shown when a gas is being collected from the patient and either filling, path "a" or bypassing the sample tube 10, path "aa ". In Figure 1b the gas flow path "b" is shown when the sample is being diverted to the gas composition sensor.

Claims:

1. An apparatus for measuring a breath analyte comprising:

a nasal prong;

a nosepiece comprising an inlet and an outlet;

a first flow channel extending from the nasal prong to the nosepiece inlet;

a second flow channel within the nosepiece and extending from the nosepiece inlet to the nosepiece outlet; and

a third flow channel extending from the nosepiece outlet to a breath measurement system, wherein the first, second, and third flow channels form a fluid flow pathway to the breath measurement system having a uniform cross-sectional diameter.

2. The apparatus of claim 1, wherein all three flow channels form part of a continuous tube.

3. The apparatus of claim 2, wherein the continuous tube comprises a cross-sectional diameter between 0.01" (0.03 cm) and 0.06" (0.15 cm).

4. The apparatus of claim 3, wherein the cross-sectional diameter is between 0.02" (0.05 cm) and 0.04" (0.10 cm).

5. The apparatus of claim 1, further comprising a support connected to the nosepiece on an opposite side of the nosepiece outlet, wherein the support is not fluidly connected to the second flow channel.

6. The apparatus of claim 5, wherein the support and the third flow channel are connected, and wherein the support, the third flow channel, and the nosepiece comprise a loop.

7. The apparatus of claim 6, further comprising a connection to couple the support and the third flow channel, and wherein the loop comprises the connection.

8. The apparatus of claim 1, wherein the first, second, and third flow channels are configured for a linear gas flow profile there through.

9. The apparatus of claim 8, wherein the first, second, and third flow channels have a cross-sectional diameter between 0.01" (0.03 cm) and 0.06" (0.15 cm).

10. The apparatus of claim 9, wherein the first, second, and third flow channels have a cross-sectional diameter between 0.02" (0.05 cm) and 0.04" (0.10 cm).

11. A method for measuring a breath analyte comprising:

inserting a nasal prong into a patient, wherein

a first flow channel extends from the nasal prong to the nosepiece inlet, wherein

a second flow channel extends from the nosepiece inlet to a nosepiece outlet, and wherein

a third flow channel extends from the nosepiece outlet to a breath measurement system, wherein the first, second, and third flow channels form a fluid flow pathway to the breath measurement system having a uniform cross-sectional diameter.

12. The method of claim 11, wherein all three flow channels form part of a continuous tube.

13. The method of claim 12, wherein the continuous tube comprises a cross-sectional diameter between 0.01" (0.03 cm) and 0.06" (0.15 cm).

14. The method of claim 13, wherein the cross-sectional diameter is between 0.02" (0.05 cm) and 0.04" (0.10 cm).

15. The method of claim 11, further comprising a support connected to the nosepiece on an opposite side of the nosepiece outlet, wherein the support is not fluidly connected to the second flow channel.

16. The method of claim 15, wherein the support and the third flow channel are connected, and wherein the support, the third flow channel, and the nosepiece comprise a loop.

17. The method of claim 16, further comprising a connection to couple the support and the third flow channel, and wherein the loop comprises the connection.

18. The method of claim 11, wherein the first, second, and third flow channels are configured for a linear gas flow profile there through.

19. The method of claim 18, wherein the first, second, and third flow channels have a cross-sectional diameter between 0.01" (0.03 cm) and 0.06" (0.15 cm).

20. The method of claim 19, wherein the first, second, and third flow channels have a cross-sectional diameter between 0.02" (0.05 cm) and 0.04" (0.10 cm).