

CLAIMSWhat is claimed is:

1. A personal respiratory isolation system (PRIS), comprising:
an enclosure having:
an aperture configured to receive only a portion of a body of a user into an interior of the enclosure so that a nose and a mouth of the user are contained within the enclosure;
one or more rigid portions, at least a part of which is disposed to shield the nose and the mouth of the user from an environment in which the user is located while the nose and the mouth of the user are contained within the enclosure, the at least the part of the one or more rigid portions which is disposed to shield the nose and the mouth of the user being a shield;
an opening via which ambient air enters into the interior of the enclosure; and
a flow output port coupled to a negative pressure source disposed outside of the enclosure, the negative pressure source operable to draw air that is disposed within the interior of the enclosure through the flow output port to thereby provide a negative pressure within the interior of the enclosure, the drawn interior air including fluid that has been at least one of exhaled or expelled by the user.
2. The personal respiratory isolation system of claim 1, further comprising the negative pressure source.
3. The personal respiratory isolation system of any one of the preceding claims, wherein at least one of: the shield is transparent, the shield is substantially rigid, the shield is flexible, the shield is sized to shield an entirety of a face of the user, the shield is configured to avoid direct contact with the face of the user, or the shield is configured to avoid direct contact with a respiratory device worn by the user.

4. The personal respiratory isolation system of any one of the preceding claims, wherein the shield is at least partially removable from the enclosure via one or more attachment mechanisms.

5. The personal respiratory isolation system of the preceding claim, wherein the one or more attachment mechanisms include at least one of: a hinging mechanism, hook-and-loop fastening materials, or another type of attachment mechanism.

6. The personal respiratory isolation system of any one of the preceding claims, wherein the shield is entirely removable from a remainder of the enclosure.

7. The personal respiratory isolation system of any one of the preceding claims, wherein at least one of: an interior surface of the shield is coated with one or more anti-fogging substances, or the shield comprises one or more anti-fogging materials.

8. The personal respiratory isolation system of any one of the preceding claims, wherein the shield is a first portion of the one or more rigid portions, and a second portion of the one or more rigid portions of the enclosure is disposed to cover a non-facial portion of a head of the user while the nose and the mouth of the user are contained within the enclosure.

9. The personal respiratory isolation system of the preceding claim, wherein the portion of the body of the user received into the aperture excludes shoulders of the user, and the second portion of the one or more rigid portions of the enclosure is one of: a cap, a hood, a helmet, or another type of hard shell.

10. The personal respiratory isolation system of any one of the preceding claims, wherein the one or more rigid portions of the enclosure are configured to avoid direct contact with a face of the user while the nose and the mouth of the user are contained within the enclosure.

11. The personal respiratory isolation system of any one of the preceding claims, wherein the one or more rigid portions of the enclosure have a structure that withstands the negative pressure within the interior of the enclosure.

12. The personal respiratory isolation system of any one of the preceding claims, wherein the ambient air opening is included in the aperture, and the aperture is at least partially formed by the one or more rigid portions.

13. The personal respiratory isolation system of any one of the preceding claims, wherein the portion of the body of the user received into the aperture excludes shoulders of the user, and the PRIS further comprises one or more flexible portions disposed to cover at least one of: at least a portion of a neck of the user or a non-facial portion of a head of the user while the nose and the mouth of the user are contained within the enclosure.

14. The personal respiratory isolation system of the preceding claim, wherein the one or more flexible portions comprise at least one of a cape, a drape, or a section of pliable or supple material.

15. The personal respiratory isolation system of any one of claims 13-14, wherein the one or more flexible portions are attached to the one or more rigid portions.

16. The personal respiratory isolation system of the preceding claim, wherein the one or more flexible portions are removably attached to the one or more rigid portions.

17. The personal respiratory isolation system of any one of claims 13-16, wherein the one or more flexible portions are disposed to cover both the neck and the non-facial portion of the head of the user.

18. The personal respiratory isolation system of any one of claims 13-17, wherein the one or more flexible portions are disposed to cover the shoulders of the user.

19. The personal respiratory isolation system of any one of claims 13-18, wherein the aperture is at least partially formed by the one or more flexible portions.

20. The personal respiratory isolation system of any one of claims 13-19, wherein the ambient air opening is at least partially formed by the one or more flexible portions.

21. The personal respiratory isolation system of any one of claims 13-20, wherein at least a first portion of the one or more flexible portions is for single use.

22. The personal respiratory isolation system of any one of claims 13-21, wherein at least a second portion of the one or more flexible portions is able to be sterilized and re-used.

23. The personal respiratory isolation system of any one of claims 13-24, further comprising an adjustable fitting mechanism to fit the PRIS to the user, the adjustable fitting mechanism coupled to the one or more flexible portions.

24. The personal respiratory isolation system of any one of claims 1-22, further comprising an adjustable fitting mechanism to fit the PRIS to the user.

25. The personal respiratory isolation system of any one of the preceding claims, wherein the fluid that has been at least one of exhaled or expelled by the user is a first fluid, and the PRIS further comprises a flow inlet configured to receive tubing via which a second fluid is delivered from an external fluid source into the interior of the enclosure for at least one of inhalation or ingestion by the user.

26. The personal respiratory isolation system of the preceding claim, wherein the aperture includes the flow inlet.

27. The personal respiratory isolation system of the preceding claim, wherein:

the PRIS further comprises one or more flexible portions disposed to cover at least one of: at least a portion of a neck of the user, a non-facial portion of a head of the user, or shoulders of the user while the nose and the mouth of the user are contained within the enclosure; and

the one or more flexible portions are disposed further to cover the tubing received into the interior of the enclosure via the flow inlet included in the aperture.

28. The personal respiratory isolation system of claim 25, wherein the flow inlet is a flow inlet port disposed in the one or more rigid portions of the enclosure.

29. The personal respiratory isolation system of any one of claims 25-28, wherein the tubing is coupled to an inflow control valve to control at least one of an amount or a flow rate of the second fluid delivered to the user.

30. The personal respiratory isolation system of any one of claims 25-29, wherein the tubing is coupled to a sensor and a status indicator, and the status indicator is configured to provide an indication of the at least one of the amount or the flow rate of the second fluid delivered to the user based on an output of the sensor.

31. The personal respiratory isolation system of the preceding claim, wherein the status indicator is configured to further provide an indication of at least one of an alarm or an alert corresponding to the at least one of the amount or the flow rate of the second fluid delivered to the user.

32. The personal respiratory isolation system of any one of claims 25-31, wherein the second fluid includes at least one of oxygen, a medication, or a therapeutic.

33. The personal respiratory isolation system of any one of claims 25-32, wherein the tubing is coupled to a device that is disposed within the interior of the enclosure and via which the second fluid is delivered to the user.

34. The personal respiratory isolation system of the preceding claim, wherein the device is one of a nasal cannula, a face mask, a Continuous Positive Airway Pressure (CPAP) device, a multi-level Positive Airway Pressure device, or another type of cannula or respiratory device.

35. The personal respiratory isolation system of the preceding claim, wherein the device is a heated high flow nasal cannula.

36. The personal respiratory isolation system of any one of claims 33-35, wherein the device is disposed to deliver positive pressure into airways of the user.

37. The personal respiratory isolation system of any one of claims 33-36, wherein the second fluid includes a gas, and the device is configured to deliver the gas to the user at a flow rate of up to 100 liters per minute.

38. The personal respiratory isolation system of claims 25-37, wherein at least one of an amount of a flow rate of interior air that is drawn through the flow output port or an amount or a flow rate of the second fluid is adjustable to thereby maintain a desired pressure within the interior of the enclosure.

39. The personal respiratory isolation system of the preceding claim, wherein the amount or the flow rate of the drawn interior air and the amount of the flow rate of the second fluid are jointly adjustable to thereby maintain the desired pressure within the interior of the enclosure.

40. The personal respiratory isolation system of any one of 38-39, wherein the PRIS further comprises a set of computer-executable instructions stored on one or more tangible memories and executable by one or more processors to adjust at least one of the amount or the flow rate of the drawn interior air or the amount of the flow rate of the second fluid to thereby maintain the desired pressure within the interior of the enclosure.

41. The personal respiratory isolation system of the preceding claim, wherein the system further comprises one or more sensors, and the set of computer-executable instructions is executable by the one or more processors to automatically and continually adjust, based on one or more updated outputs generated by the one or more sensors, at least one of the amount or the flow rate of the drawn interior air or the amount of the flow rate of the second fluid to thereby maintain the desired pressure within the interior of the enclosure.

42. The personal respiratory isolation system of any one of claims 40-41, wherein the set of computer-executable instructions is executable further to provide a user interface via which an operator at least one of: modifies control of the adjusting of the at least one of the amount or the flow rate of the drawn interior air or the amount of the flow rate of the second fluid, modifies a level of the desired pressure, or sets or changes at least one of an alarm condition or an alert condition corresponding to the at least one of the amount or the flow rate of the drawn interior air or the amount of the flow rate of the second fluid.

43. The personal respiratory isolation system of any one of claims 40-42, wherein the set of computer-executable instructions is executable further to communicate, to another computing device, data corresponding a usage of the PRIS by the user.

44. The personal respiratory isolation system of the preceding claim, wherein the another computing device administers electronic medical records.

45. The personal respiratory isolation system of any one of the preceding claims, wherein the flow output port is removably and fluidly coupled to the negative pressure source.

46. The personal respiratory isolation system of the preceding claim, wherein the flow output port is fluidly coupled to the negative pressure source via a hose or a tube.

47. The personal respiratory isolation system of any one of the preceding claims, wherein the flow output port is disposed in the one or more rigid portions of the enclosure.

48. The personal respiratory isolation system of the preceding claim, wherein the flow output port is integral with the one or more rigid portions of the enclosure.

49. The personal respiratory isolation system of any one of the preceding claims, wherein the flow output port is a sealed port.

50. The personal respiratory isolation system of any one of the preceding claims, at least one of the flow output port or the negative pressure source is coupled to a flow output control valve, and wherein at least one of an amount or a flow rate of the drawn interior air is at least one of adjustable or controlled via the flow output control valve.

51. The personal respiratory isolation system of any one of the preceding claims, wherein the negative pressure source is operable to further provide a zero pressure within the interior of the enclosure.

52. The personal respiratory isolation system of any one of claims 50-51, wherein at least one of the flow output control valve or the negative pressure source is variably operable to draw the air that is disposed within the interior of the enclosure through the flow output port to thereby maintain a desired pressure within the interior of the enclosure.

53. The personal respiratory isolation system of any one of the preceding claims, wherein the flow output port is coupled to a sensor and a status indicator, and the status indicator is configured to provide an indication of the at least one of the amount or the flow rate of the drawn interior air based on an output of the sensor.

54. The personal respiratory isolation system of the preceding claim, wherein the status indicator is configured to further provide an indication of at least one of an alarm or an alert corresponding to the at least one of the amount or the flow rate of the drawn interior air.

55. The personal respiratory isolation system of any one of the preceding claims, wherein the negative pressure source is operable to draw the ambient air into the interior of the enclosure via the ambient air opening, and wherein the interior air drawn through the flow output port further includes the ambient air drawn into the interior of the enclosure by the negative pressure source.

56. The personal respiratory isolation system of the preceding claim, wherein at least one of an amount or a flow rate of the ambient air that is drawn by the negative pressure source into the interior of the enclosure is adjustable.

57. The personal respiratory isolation system of any one of the preceding claims, wherein at least one of the flow output port or the negative pressure source includes one or more respective filters through which the air that is disposed within the interior of the enclosure is drawn prior to being vented into the environment.

58. The personal respiratory isolation system of the preceding claim, wherein the one or more respective filters include at least one of: a high-efficiency particulate air (HEPA) filter, a passive carbon filter, an active carbon filter, a medical grade air filter, or another type of air filter.

59. The personal respiratory isolation system of any one of the preceding claims, wherein the drawn interior air is exposed to a particulate impairment process prior to being vented into the environment, the particulate impairment process utilizing at least one of: ultra-violet radiation, a high temperature chamber, or another process or device that impairs at least one of a bacteria or a virus.

60. The personal respiratory isolation system of any one of the preceding claims, wherein at least a portion of the enclosure is for single use.

61. The personal respiratory isolation system of the preceding claim, wherein at least some of the one or more rigid portions are for single use.

62. The personal respiratory isolation system of any one of claims 1-21 and 23-61, wherein an entirety of the enclosure is for single use.

63. The personal respiratory isolation system of any one of claims 1-61, wherein at least a portion of the enclosure is able to be sterilized and re-used.

64. The personal respiratory isolation system of the preceding claim, wherein at least some of the one or more rigid portions are able to be sterilized and re-used.

65. The personal respiratory isolation system of any one of claims 1-20, 22-61, and 63-64, wherein an entirety of the enclosure is able to be sterilized and re-used.

66. The personal respiratory isolation system of any one of claims 1-11, 13-19, and 21-65, wherein:

the interior of the enclosure is sealed from the environment;

the ambient air opening is provided by an ambient air input port via which ambient air enters into the interior of the enclosure, the ambient air input port disposed in the one or more rigid portions; and

the PRIS further comprises an ambient air control valve to adjust at least one of an amount or a flow of the ambient air into the interior of the enclosure.

67. The personal respiratory isolation system of the preceding claim, wherein the ambient air input port is coupled to a fan that is operable to draw the ambient air into the interior of the enclosure via the ambient air input port.

68. A method of controlling a pressure of a personal respiratory isolation system (PRIS) that is being utilized by a user, the method comprising:

at a controller communicatively connected to one or more control elements associated with the PRIS, the PRIS including an enclosure, and the enclosure of the PRIS including:

an aperture via which only a portion of a body of the user has been received into an interior of the enclosure so that a nose and a mouth of the user are contained within the enclosure,

a particular portion shielding the nose and the mouth of the user from an environment in which the user is located,

an opening via which ambient air enters into the interior of the enclosure, and

a flow output port through which air that is disposed within the interior of the enclosure is being drawn by a negative pressure source, the negative pressure source coupled to the flow output port and disposed outside of the enclosure, and the interior air including (i) fluid that has been at least one of exhaled or expelled by the user, and (ii) ambient air that has been drawn, by the negative pressure source, into the interior of the enclosure via the opening;

receiving, at the controller via one or more communication interfaces, an indication of a signal generated by a sensor, the signal indicative of an amount or a flow rate of the interior air that is being drawn by the negative pressure source through the flow output port;

determining, by the controller and based on the indication of the signal, one or more adjustments to the one or more control elements; and

transmitting, by the controller via the one or more communication interfaces, indications of the one or more adjustments to the one or more control elements, thereby causing the one or more control elements to control, in accordance with the one or more adjustments, the amount or the flow rate of the interior air that is being drawn through

the flow output port, thereby maintaining a desired level of negative pressure within the interior of the enclosure.

69. The method of claim 68, wherein:

the fluid that has been at least one of exhaled or expelled by the user is first fluid, the sensor is a first sensor, and the signal is a first signal;

the enclosure of the PRIS further includes a flow inlet via which tubing is received into the interior of the enclosure, the tubing fluidly connected to an external fluid source and delivering a second fluid for at least one of inhalation or ingestion by the user;

the method further comprises receiving, at the controller via the one or more communication interfaces, an indication of a second signal generated by a second sensor, the second signal indicative of an amount or a flow rate of the second fluid that is being delivered, via the tubing, to the user;

determining the one or more adjustments to the one or more control elements is further based on the indication of the second signal; and

transmitting the respective indications of the one or more adjustments thereby causes the one or more control elements to control, in accordance with the one or more adjustments, at least one of: (i) the at least one of the amount or the flow rate of the interior air that is being drawn through the flow output port, or (ii) the amount or the flow rate of the second fluid that is being delivered to the user.

70. The method of the preceding claim, wherein the one or more control elements control the at least one of: (i) the at least one of the amount or the flow rate of the interior air that is being drawn through the flow output port, or (ii) the amount or the flow rate of the second fluid that is being delivered to the user by sending respective control signals to at least one of: the external fluid source, the negative pressure source, an input flow control valve coupled to the tubing, or an output flow control valve coupled to the flow output port.

71. The method of any one of claims 68-70, wherein:

the portion of the body that has been received into the interior of the enclosure of the PRIS excludes shoulders of the user;

the enclosure of the PRIS further includes one or more flexible portions disposed to cover at least one of: at least a portion of a neck of the user, a non-facial portion of a head of the user, or the shoulders of the user while the nose and the mouth of the user are contained within the enclosure;

the one or more flexible portions are disposed further to cover the tubing received into the interior of the enclosure via the flow inlet included in the aperture; and

the ambient air opening is formed at least partially by the one or more flexible portions.

72. The method of any one of claims 68-71, wherein the sensor generates updated signals over an interval of time, and the receiving, determining, and transmitting steps are repeatedly executed by the controller over the interval of time in accordance with the updated signals generated by the sensor.

73. The method of any one of claims 68-72, wherein the receiving, determining, and transmitting steps are automatically initiated and executed by the controller.

74. The method of any one of claims 68-73, further comprising receiving, by the controller via the one or more communication interfaces, an indication of one or more user instructions, the one or more user instructions including at least one of:

an instruction to modify the desired level of negative pressure;

an instruction to at least one of add, delete, or modify one or more alarm settings or alert settings associated with the PRIS;

an instruction to modify the determining of the one or more adjustments; or

an instruction to transmit, via the one or more communication interfaces to at least one of a user interface or another computing device, data corresponding to operations of the PRIS associated with the user.

75. The method of the preceding claim, wherein the user interface is included in a computing device that is operated by an operator and communicatively connected to the controller.

76. The method of the preceding claim, wherein the computing device is communicatively connected to the controller via at least one of a wireless communication link or a wired communication link.

77. The method of any one of claims 68-76, wherein the one or more control elements control the at least one of the amount or the flow rate of the interior air that is being drawn by the negative pressure source through the flow output port by sending respective control signals to at least one of the negative pressure source or an output flow control valve coupled to the flow output port.

78. The method of any one of claims 68-77, wherein the PRIS further includes the negative pressure source.

79. The personal respiratory system of any one of claims 1-67, further comprising:
one or more user outflow sensors positioned to detect one or more characteristics of a fluid outflow of the user, the user fluid outflow including fluid that has been exhaled by the user;
and

an outflow user interface that is communicatively connected to the one or more user outflow sensors and via which information indicative of the one or more characteristics of the user fluid outflow is presented.

80. The personal respiratory system of claim 79, wherein the one or more characteristics of the user fluid outflow includes a volume of user fluid outflow.

81. The personal respiratory system of any one of claims 79-80, wherein the one or more characteristics of the user fluid outflow includes a rate of user fluid outflow.

82. The personal respiratory system of any one of claims 79-81, wherein the one or more characteristics of the user fluid outflow includes respective levels of one or more components of the user fluid outflow.

83. The personal respiratory system of the preceding claim, wherein the one or more components of the user fluid outflow include at least one of: oxygen, an aerosolized therapeutic or medicine, a volatile organic compound, a volatile inorganic compound, or a pathogen.

84. The personal respiratory system of any one of claims 79-83, wherein the one or more user outflow sensors and the outflow user interface are included in a monitoring device that continuously monitors the one or more characteristics of the user fluid outflow and updates the information indicative of the one or more characteristics accordingly.

85. The personal respiratory system of any one of claims 79-84, wherein the outflow user interface includes at least one of a visual user interface, an auditory user interface, or respective interfaces to one or more computing devices.

86. The personal respiratory system of the preceding claim, wherein at least a first computing device of the one or more computing devices administers electronic medical records.

87. The personal respiratory system of any one of claims 85-86, wherein at least a second computing device of the one or more computing devices executes one or more analytics on the information indicative of the one or more characteristics of the user fluid outflow.

88. The personal respiratory system of any one of claims 79-87, wherein at least a first portion of the one or more user outflow sensors is disposed within the interior of the enclosure of the PRIS.

89. The personal respiratory system of any one of claims 79-88, wherein a part of the first portion of the one or more user outflow sensors is disposed in a device that is worn by the user and disposed within the interior of the enclosure of the PRIS.

90. The personal respiratory system of any one of claims 79-89, wherein at least a second portion of the one or more user outflow sensors is disposed outside of the enclosure of the PRIS and are in fluid connection with the flow output port.

91. The personal respiratory system of any one of claims 79-90, wherein a diagnosis of a condition of the user is generated at least in part based on the information indicative of the one or more characteristics of the user fluid outflow.

92. The personal respiratory system of any one of claims 79-91, wherein a treatment plan for the user is generated at least in part based on the information indicative of the one or more characteristics of the user fluid outflow.

93. The method of any one of claims 68-78, wherein the PRIS is the PRIS of any one of claims 1-67 and 79-92, and the particular portion of the enclosure of the any one of claims 68-78 is the shield of the any one of claims 1-67 and 79-92.

94. Any one of the preceding claims in combination with any other one of the preceding claims.