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(54) APPARATUS FOR CONNECTING OXYGEN DELIVERY CONTROL INSTRUMENT TO PATIENT DELIVERY DEVICE

VORRICHTUNG ZUM VERBINDEN EINES SAUERSTOFFZUFUHRSTEUERUNGSINSTRUMENTS MIT EINER PATIENTENABGABEVORRICHTUNG

APPAREIL DE CONNEXION D'UN INSTRUMENT DE COMMANDE DE DISTRIBUTION D'OXYGÈNE À UN DISPOSITIF D'ADMINISTRATION DE PATIENT

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Description

TECHNICAL FIELD

[0001] The present disclosure relates generally to a system and method to deliver oxygen to a patient from an oxygen delivery device to a patient interface. More specifically, the present disclosure relates to a method and apparatus for connecting a patient interface and an oxygen delivery device.

BACKGROUND

[0002] Oxygen is often supplied to patients during medical procedures. Known methods for regulating oxygen supply may provide increased benefits for patient safety. Such systems are disclosed, for example, in U.S. Patent Nos. 10,159,815 and 10,143,820. Many respiratory systems are characterized by complexity and diversity of possible applications. Often, a plurality of components must be connected before a respiratory system is used. WO 2014/164813 describes a Y-connector which may be used to facilitate the operative interface of a patient mask to a ventilator within a ventilation system. The tubing arrangement described may comprise a pair of bi-lumen tubes, with one end of the bi-lumen tubes fluidly connected to the mask, and the other end fluidly connected to the Y-connector.

[0003] Different interfaces usually have to be connected using means of connection, and in some cases this can give rise to an increased risk of error and possibly cause a dangerous situation for a patient. A standard connection from a patient interface, such as a nasal cannula or a CPAP mask, for example, may be provided to the oxygen delivery device or respiratory system. Risks of incorrect connection include both a wrong connection and an incomplete connection (that is, the connection is only partial, and the patient is not delivered sufficient oxygen as a result). An incomplete connection may occur with partial insertion, or if a connector is inserted fully and then later becomes partially dislodged.

[0004] It may be advantageous, therefore, to provide a connector to reduce the risk of incorrect connections and/or partial connections.

SUMMARY OF DISCLOSURE

[0005] The invention is defined by the appended claims. $

[0006] The connector for connecting a patient interface to an oxygen delivery control device according to the present invention includes: a first lumen for conveying pressurized oxygen from a pressurized oxygen source in connection with the oxygen delivery control device to the patient interface; a second lumen for measuring patient breath pressure second lumen having a smaller diameter than the first lumen; wherein the first and second lumens are enclosed in a housing, the housing having a top surface, the top surface comprising a first top surface portion and a second top surface portion, the first top surface portion of the housing comprising at least one encoding optical reflectivity pad configured to enable identification of information relating to the patient interface, and wherein an open slot in the top surface of the housing separates the first top surface portion and the second top surface portion, the open slot configured to receive an optical isolation wall of the oxygen delivery control device; the first top surface portion having a larger width than a width of the second top surface portion and wherein the second top surface portion of the housing comprises a chamfer proximal to the open slot, the chamfer configured to enable measurement of a depth of the housing within the oxygen delivery control device.

[0007] The first lumen may be configured to receive a standard clinical oxygen barb connector, whereas the second lumen cannot receive a standard clinical oxygen barb connector.

[0008] In some configurations, the information relating to the patient interface comprises a type of patient interface and/or size of patient interface. The type of patient interface may be selected from at least one of a nasal cannula, a CPAP mask, an auxiliary oxygen tube, and a drug nebulizer. The size of patient interface may be selected from at least one of adult, pediatric, and neonatal.

[0009] According to another aspect, the at least one encoding optical reflectivity pad may be configured to cause a software constraint relating to maximum oxygen flow when the at least one encoding optical reflectivity pad is inserted into the oxygen delivery control device.

[0010] According to another aspect, a third lumen may be provided in the connector. The third lumen may have a diameter smaller than the diameter of the first lumen. The third lumen may be for drawing a sample of gas for analysis, for example, exhaled CO_2 concentration analysis.

[0011] According to another aspect, the first and second lumens are formed from a flexible material, while the housing may be formed of a rigid material.

[0012] According to another aspect of the present disclosure, a connector is described herein, the connector including: a housing, the housing having a top surface extending from a first side to a second side, the top surface comprising a patient interface encoding portion and a depth measurement insertion portion, and wherein an open slot in the top surface of the housing separates the patient interface encoding portion and the depth measurement insertion portion; wherein the patient interface encoding portion of the housing comprises means to enable identification of information relating to the patient interface; wherein the depth measurement insertion portion of the housing comprises means to enable measurement of a depth of the housing within the oxygen delivery control device; and wherein the housing encloses a first lumen and a second lumen, the first lumen for conveying pressurized oxygen and the second lumen for measuring of intra-nasal pressure at the patient interface,

the second lumen having a smaller diameter than the first lumen.

[0013] In some configurations, the open slot may be positioned closer to the second side of the housing. In some configurations, the means to enable identification of information relating to the patient interface comprises means for optical detection, for example, at least two reflective pads, the at least two reflective pads configured to reflect infrared light at one of high reflectivity, low reflectivity, and intermediate reflectivity.

[0014] According to another aspect, the means to enable detection of a depth of the housing within the oxygen delivery control device comprises at least one of: a triangle printed on the depth insertion portion, a gradient printed on the depth insertion portion, an angled cut-away formed in the depth insertion portion, and a reflective pad placed on the depth insertion portion. The means to enable detection of a depth of the housing within the oxygen delivery control device, in some configurations, comprises a continuously variable reflective pad. In some configurations, a third lumen may be provided to enable end-tidal CO_2 measurement, the third lumen having a diameter smaller than the diameter of the first lumen.

[0015] According to yet another aspect of the present disclosure, a system for delivering oxygen to a patient may include: a patient interface; an oxygen delivery control device comprising a receptacle with an optical isolation wall formed therein; and a connector for connection the patient interface to the oxygen delivery control device, the connector comprising: a first lumen for conveying pressurized oxygen from a pressurized oxygen source in connection with the oxygen delivery control device to the patient interface; a second lumen for measuring pressure at the patient interface, the second lumen having a smaller diameter than the first lumen; wherein the first and second lumens are enclosed in a housing, the housing having a top surface, the top surface comprising a first top surface portion and a second top surface portion, the first top surface portion having a larger width than a width of the second top surface portion, and wherein an open slot in the top surface of the housing separates the first top surface portion and the second top surface portion, the open slot configured to receive the optical isolation wall of the oxygen delivery control device; wherein the first top surface portion of the housing comprises at least one encoding optical reflectivity pad configured to enable identification of information relating to the patient interface; and wherein the second top surface portion of the housing comprises a chamfer proximal to the open slot, the chamfer configured to enable measurement of a depth of the housing within the oxygen delivery control device.

[0016] In some configurations, the at least one encoding optical reflectivity pad is configured to cause a software constraint relating to maximum oxygen flow when the at least one encoding optical reflectivity pad is inserted into the oxygen delivery control device. The software constraint may include, for example, one of a maximum oxygen flow, a minimum oxygen flow, a minimum mask pressure, a minimum mask pressure, and a maximum oxygen pulse frequency.

[0017] According to yet another aspect of the present disclosure, a method is disclosed for connecting a patient interface to an oxygen delivery control device, the method comprising: selecting the connector as described herein; selecting the oxygen delivery control device, the oxygen delivery control device comprising a receptacle to receive at least a portion of the housing of the connector, the receptacle having an isolation wall formed therein, and the oxygen delivery control device further comprising at least two optical sensors proximal to the receptacle; and inserting the housing of the connector into the receptacle of the oxygen delivery control device. In some configurations, the method may also include the steps of a first optical sensor identifying information relating to the patient interface based on the at least one encoding optical reflectivity pad; and a second optical sensor measuring the depth of the housing within the receptacle.

BRIEF DESCRIPTION OF DRAWINGS

[0018] The following drawings illustrate what are currently considered to be specific representative configurations for carrying out the technology and are not limiting as to embodiments which may be made in accordance with the present technology.

[0019] The components in the drawings are not necessarily to scale relative to each other. Like reference numerals designate corresponding parts throughout the several views.

[0020] The drawings are illustrative and not limiting of the scope of the invention which is defined by the appended claims.

FIG. 1 shows a perspective view of a connector as described herein for connecting a patient interface to an oxygen delivery control device.

FIG. 2 shows a top, plan view of the connector of FIG. 1, attached to a patient interface shown in diagrammatic view.

FIG. 3 shows a perspective view of the connector of FIG. 1 and an oxygen delivery control device to receive at least part of the connector.

FIG. 4 shows a front, plan view of the oxygen delivery control device.

FIG. 5A shows a front view of one configuration of a connector housing as described herein.

FIG. 5B shows a top view of the connector housing of FIG. 5A.

FIG. 6A shows a front view of one configuration of a connector housing as described herein.

FIG. 6B shows a top view of the connector housing of FIG. 6A.

FIG. 7A shows a front view of one configuration of a connector housing as described herein.

FIG. 7B shows a front view of one configuration of a

connector housing as described herein.

FIG. 7C shows a top view of the connector housing of FIG. 7A and/or 7B.

FIG. 8A shows a front view of one configuration of a connector housing as described herein.

FIG. 8B shows a front view of one configuration of a connector housing as described herein.

FIG. 8C shows a front view of one configuration of a connector housing as described herein.

FIG. 8D shows a top view of the connector housing of FIG. 8A, 8B, and/or 8C.

FIG. 8E shows a side view of the connector of FIG. 8C.

FIG. 9 shows a front view of one configuration of a connector housing with an optional third lumen as described herein.

DETAILED DESCRIPTION

[0021] The following provides a detailed description of particular embodiments of the present disclosure.

[0022] Reference will now be made to the drawings in which the various elements of the illustrated configurations will be given numerical designations and in which the technology will be discussed so as to enable one skilled in the art to make and use the technology.

[0023] It will be appreciated that various aspects discussed in one drawing may be present and/or used in conjunction with the embodiment shown in another drawing, and each element shown in multiple drawings may be discussed only once. For example, in some cases, detailed description of well-known items or repeated description of substantially the same configurations may be omitted. This facilitates the understanding of those skilled in the art by avoiding an unnecessarily redundant description. The accompanying drawings and the following description are provided in order for those skilled in the art to fully understand the present disclosure, and these are not intended to limit the gist disclosed in the scope of claims.

[0024] It should be noted that the description merely illustrates the principles of the present subject matter.

[0025] Furthermore, the described features, structures, or characteristics of configurations of the technology may be combined in any suitable manner in one or more configurations. In the following description, numerous specific details are provided, such as examples of products or manufacturing techniques that may be used, to provide a thorough understanding of configurations of the technology.

[0026] It should also be noted that, as used in this specification and the appended claims, singular forms such as "a," "an," and "the" may include the plural unless the context clearly dictates otherwise. Thus, for example, reference to "a micro controller" may include one or more of such microcontrollers, and reference to "the sensor" may include reference to one or more of such sensors.

[0027] As used herein, the term "substantially" refers to the complete or nearly complete extent or degree of an action, characteristic, property, state, structure, item, or result to function as indicated. For example, an object, such as a reflectivity pad, that is "substantially" continuously variable would mean that the object is either completely continuously variable or nearly completely continuously variable. The use of "substantially" is equally applicable when used in a negative connotation to refer to the complete or near complete lack of an action, characteristic, property, state, structure, item, or result.

[0028] As used herein the term "generally" refers to something that is more of the designated adjective than not, or the converse if used in the negative.

[0029] As used herein, the term "about" is used to provide flexibility to a numerical range endpoint by providing that a given value may be "a little above" or "a little below" the endpoint while still accomplishing the function associated with the range.

[0030] As used herein, a plurality of items, structural elements, compositional elements, and/or materials may be presented in a common list for convenience. However, these lists should be construed as though each member of the list is individually identified as a separate and unique member.

[0031] Concentrations, amounts, proportions and other numerical data may be expressed or presented herein in a range format. It is to be understood that such a range format is used merely for convenience and brevity and thus should be interpreted flexibly to include not only the numerical values explicitly recited as the limits of the range, but also to include all the individual numerical values or sub-ranges encompassed within that range as if each numerical value and sub-range is explicitly recited. As an illustration, a numerical range of "about 1 to about 5" should be interpreted to include not only the explicitly recited values of about 1 to about 5, but also include individual values and sub-ranges within the indicated range. Thus, included in this numerical range are individual values such as 2, 3, and 4 and sub-ranges such as from 1-3, from 2-4, and from 3-5, etc., as well as 1, 2, 3, 4, and 5, individually. This same principle applies to ranges reciting only one numerical value as a minimum or a maximum. Furthermore, such an interpretation should apply regardless of the breadth of the range or the characteristics being described.

[0032] It should be noted that the description merely illustrates the principles of the present subject matter.

[0033] The manner in which the systems and methods may be implemented is explained in details with respect to the figures. While aspects of described systems and methods can be implemented in any number of different computing systems, transmission environments, and/or configurations, the embodiments are described in the context of the following exemplary system(s).

[0034] It will also be appreciated by those skilled in the art that the words during, while, and when as used herein are not exact terms that mean an action takes place instantly upon an initiating action but that there may be

some small but reasonable delay, such as a propagation delay, between the initial action and the reaction that is initiated by the initial action. Additionally, the word "connected" and "coupled" is used throughout for clarity of the description and can include either a direct connection or an indirect connection. As used herein, "lumen" refers to a generally hollow tubular structure.

[0035] The present disclosure relates generally to a connector for connecting an oxygen delivery system to a specific patient interface. One particular embodiment of the present disclosure is shown and described in the connector of FIGs. 1-2. The connector 10 may include a patient interface 47 on one end (FIG. 2), and a housing 15 on the other end configured to be plugged into an oxygen delivery device. The connector according to the present disclosure includes a housing 15 that encloses a first lumen 20 and a second lumen 24. The first lumen 20 is configured to convey pressurized oxygen from a pressurized oxygen source in connection with the oxygen delivery control device to the patient interface. In addition to being able to connect with the oxygen delivery device, the first lumen 20 may also be sized to connect directly to a standard clinical oxygen barb connector. For example, the first lumen 20 or oxygen lumen may have an inner diameter of about 5 mm to about 6.35 mm (about 0.2" to about 0.25" inner diameter). In other configurations, the first lumen 20 may have an inner diameter of about 4 mm to about 8 mm.

[0036] The second lumen 24 is provided for measuring patient breath pressure. Patient breath pressure may depend on the type of patient interface used. For example, patient breath pressure may be nasal pressure, breathing mask pressure, patient airway pressure, etc. According to the present disclosure, the second lumen 24 is smaller than the first lumen 20, such that the second lumen 24 cannot be plugged into a standard clinical oxygen barb connector. For example, the second lumen 24 may have an inner diameter of less than 5 mm (or less than 0.14"). In some configurations, the second lumen 24 may have an inner diameter of about 3 mm to about 4 mm.

[0037] Each of the first and the second lumens may be formed of a flexible material. For example, flexible PVC may be used (such as Geon HC, by PolyOne Corp., or any other suitable flexible material known in the art). The flexible material may allow the first lumen 20 to be connected/stretched over a standard clinical oxygen barb fitting.

[0038] In some configurations, a third lumen 27 may be provided (FIG. 9). The third lumen 27 may also have a diameter smaller than the diameter of the first lumen 20 to prevent the third lumen 27 from being connected to a standard oxygen barb fitting. The third lumen 27 may provide an additional lumen for drawing a sample of gas for analysis. For example, the third lumen may be used to draw a sample of exhaled CO_2 for end-tidal CO_2 analysis.

[0039] The housing 15 of the connector 10 substantially surrounds the first and second lumens, and has one open side to be inserted into a receptacle 48 of an oxygen delivery device 49 (FIG. 3). The housing 15 may be formed from a rigid or semi-rigid material to facilitate insertion into the oxygen delivery device 49. The housing 15 may have a top surface extending from a first side to a second side. The top surface is provided with a first portion 30, or patient interface encoding portion 30, and a second portion 35, or depth measurement insertion portion 35. An open slot 38 in the top surface of the housing 15 separates the patient interface encoding portion 30 and the depth measurement insertion portion 35. While the patient interface encoding portion 30 and depth measurement insertion portion 35 are according to the present disclosure defined as being located on a "top" surface of the housing 15, it will be appreciated that they may be located on any of the outer surfaces of the housing 15, such as the bottom, sides, etc. According to the present invention, the patient interface encoding portion 30 is on the same surface of the housing as the depth measurement insertion portion 35. According to the present disclosure, it is also conceivable that the patient interface encoding portion 30 may be located on a side surface of the housing, and the depth measurement insertion portion 35 may be located on a top surface of the housing. Additionally, the connector could be rotated at any angle with the corresponding receptacle placed on a similar angle.

[0040] The oxygen delivery device 49 comprises a receptacle 48 for receiving the housing of the connector, the receptacle 48 having one or more readers for reading the information or data associated with the patient interface encoding portion, and/or depth measurement insertion portion. For example, the receptacle 48 may be provided with optical sensors (62a-d in FIG. 4) that are placed in the receptacle 48 proximal to the portions that would interface with the patient interface encoding portion and the depth measurement insertion portion. The optical sensors may also be placed adjacent the receptacle 48. According to the present invention (FIG. 4) the receptacle 48 additionally includes an optical isolation wall 57. The open slot 38 of the housing receives the optical isolation wall when the housing is inserted into the receptacle 48 of the oxygen delivery device. In this configuration, the receptacle 48 may include optical sensors in the top portion, with three optical sensors (62a-c) immediately above the receptacle to one side of the optical isolation wall 57, and another optical sensor (62d) on the other side of the optical isolation wall 57. The receptacle 48 may also include a connector 60 for receiving the first lumen 20 and a smaller connector 65 for receiving the second lumen 24.

[0041] Turning back to FIGs. 1-2, there is shown a configuration in which the patient interface encoding portion 30 and the depth insertion measurement portion 35 of the housing 15 are not equal in size. According to the present disclosure, the width of the patient interface encoding portion 30 is larger than the width of the depth insertion measurement portion 35. An open slot 38 in the

top surface of the housing 15 separates the first top surface portion 30 and the second top surface portion 35, the open slot 38 configured to receive an optical isolation wall of the oxygen delivery control device. In other words, the open slot 38 is located towards one side of the top surface of the housing 15. For example, the open slot 38 may be positioned closer to the second side of the housing 15. This may allow the housing 15 of the connector to only be inserted in one manner into the receptacle 48 and prevent upside-down insertion and other improperly aligned insertions, etc.

[0042] The patient interface encoding portion 30 of the housing 15 includes means to enable identification of information relating to the patient interface. According to the present disclosure, the first top surface portion 30 or patient interface encoding portion 30 comprises at least one encoding optical reflectivity pad configured to enable identification of information relating to the patient interface. According to the present disclosure, other types of means for encoding information may also be used. The patient interface encoding portion of the housing may be marked/printed with a pattern that identifies information relating to the patient interface. The pattern may be comprised of multiple pads, each of which reflects light, for example, light in the visual and/or infrared wavelengths, in a variable amount (high reflectivity, low reflectivity, or intermediate). The arrangement of the reflectivity pads and the amount of reflectivity of the pads may corresponds to a code that allows the instrument to determine the specific type of patient interface that is plugged into the receptacle. The information relating to the patient interface may include, for example, type of patient interface, and/or a size of patient interface. Examples of types of patient interfaces include nasal cannulas, CPAP masks, auxiliary oxygen tubes, drug nebulizers, etc. The size of the patient interface may be, for example, adult, pediatric, neonatal, etc.

[0043] The information relating to the patient interface 47 may be read by one or more readers (such as optical sensors) located within the receptacle 48 of the oxygen delivery device, and cause a software constraint relating to maximum oxygen flow, minimum oxygen flow, minimum and/or maximum mask pressure, maximum oxygen pulse frequency, etc., and/or another parameter. For example, if the oxygen delivery device reads the patient interface encoding portion and determines the patient interface is a neonatal nasal cannula, a maximum oxygen flow rate may be set that prevents the patient from receiving an oxygen flow that is not safe. If the oxygen delivery device reads the patient interface encoding portion and determines the patient interface is an adult CPAP mask the device will operate to control pressure within the mask rather than to control rate of oxygen flow through a cannula.

[0044] The depth measurement insertion portion 35 of the housing 15 of the connector 10 may include means to enable measurement of a depth of the housing 15 within the receptacle 48 of the oxygen delivery control device 49. For example, the means may include a triangle printed on the depth insertion portion (see FIG. 7C), a gradient printed on the depth insertion portion (FIG. 6B), an angled cut-away formed in the depth insertion portion (FIG. 5B showing chamfer 40), and a reflective pad placed on the depth insertion portion (FIG. 8D).

[0045] According to the present disclosure, a chamfer 40 is provided proximal to the open slot 38, the chamfer 40 configured to enable measurement of a depth of the housing within the oxygen delivery control device. The chamfer 40 may allow an optical sensor to sense an increasing amount of reflectivity with insertion depth. The housing 15 may be molded such that a chamfer 40 would be located below an insertion depth optical sensor (62d in FIG. 4) of the receptacle 48. In this configuration the amount of light that is reflected from the top surface of the housing 15 increases as the connector 10 is inserted as there is more material immediately below the sensor to reflect light. By removing the material of the housing 15 below the sensor, the reflection is decreased. The chamfer 40 may allow an optical detector to detect reflectance, and as the housing 15 is inserted into the receptacle 48, reflectance may increase with depth of insertion.

[0046] Other configurations may also be used such that the amount of reflected light is a function of the housing insertion depth into the receptacle 48. For example, as seen in FIG. 7C, a continuously variable reflector may be incorporated by printing an arrow or triangle on the depth measurement insertion portion 35" such that when the housing is inserted the variable reflector is positioned under the depth sensing optical sensor of the receptacle. As the housing is advanced into the receptacle 48, the amount of reflected light increases, or decreases, according to the depth of insertion. Various patterns may be printed on the depth measurement insertion portion 35 to achieve this effect. Examples of depth insertion sensing patterns include a white to black gradient pattern where the darkness of the print below the sensor becomes progressively darker or lighter from one extreme to the other extreme. Alternatively, this could be done by blending colors (other than black or white) to create a gradient of reflectivity. Another method of creating a linearly increasing reflectivity pattern is to print an arrow or wedge of a dark area on a light background. Note that the logic could be inverted in each of these cases, for example the reflectivity would be greatest at the tip or at the base, as long as it is variable according to distance from the tip of the connector. A continuously variable reflective pad or substantially continuously variable reflective pad may also be provided. FIGs. 5A through 8E illustrate various reflectivity pads and chamfers that may be used to detect depth of the housing within the receptacle and type of patient interface.

[0047] Another method of creating an insertion depth measurement with an optical sensor is to alter the distance between the sensor and the housing. The distance between the optical LED and detector pair and the re-

flective surfaced affects the reflected light signal. By adding a sloped surface on the top of the housing below the optical sensor, the amount of reflected light becomes a function of housing 15 insertion depth. That is, the sloped surfaced causes the distance between the optical sensor and the surface to change as the connector is inserted thereby changing the reflectivity. See FIG. 8E showing a side view of a housing 15 with a sloped surface on the depth measurement insertion portion 35‴. FIG. 8C shows a front view of the housing of FIG. 8E.

[0048] In use, a clinician may first select a connector with an appropriate patient interface (including, for example, patient size and type of interface). The clinician may then insert the housing of the connector into the receptacle of the oxygen delivery control device. The housing may only be able to be inserted into the receptacle in one manner due to the shape of the housing, the off-set optical isolation wall, etc. This may prevent a clinician from improperly inserting the housing of the connector into the receptacle and defeating the benefits of correct insertion. The first lumen 20 of the housing 15 may attach to the connector 60 of the receptacle 48, and the second lumen 24 may attach to the connector 65.

[0049] Upon insertion, the optical sensors of the oxygen delivery control device proximal to the receptacle may detect information relating to the patient interface, including the type of interface, size, etc. For example, optical sensors 62a-c of FIG. 4 may read reflectivity pads on the first portion 30 of the top of the housing 15 of the connector 10. Upon detection, the optical sensors may send a signal relating to the patient interface to one or more processors. The one or more processors may then constrain the software of the oxygen delivery control device with parameters appropriate for the patient interface.

[0050] Additionally upon insertion, the optical sensor (for example, 62d) of the oxygen delivery control device proximal to the depth measurement insertion portion may measure the amount of reflectance and send a signal to one or more processors relating to the depth of the housing within the receptacle. The one or more processors may then determine if the depth is sufficient, and, if it is not, send an alarm to be outputted. For example, the one or more processors may compare the measured depth to a predetermined threshold depth and any depth that is less than the predetermined threshold may cause the alarm to be triggered. The alarm may include, for example, a visual alarm on the screen 66 of the oxygen delivery control device, and/or an audible alarm. The alarm may alert the clinician the housing of the connector is not inserted far enough and allow the clinician to correct. If the housing is inserted properly, the software may include an algorithm that continues to query the depth of the housing in the receptacle. If the housing becomes dislodged, the alarm may alert the clinician.

Claims

1. A connector (10) for connecting a patient interface (47) to an oxygen delivery control device (49), the connector (10) comprising:

   a first lumen (20) for conveying pressurized oxygen from a pressurized oxygen source in connection with the oxygen delivery control device (49) to the patient interface (47);
   a second lumen (24) for measuring patient breath pressure, the second lumen (24) having a smaller diameter than the first lumen (20);
   wherein the first (20) and second (24) lumens are enclosed in a housing (15), the housing (15) having a top surface, the top surface comprising a first top surface portion (30) and a second top surface portion (35), wherein the first top surface portion (30) of the housing comprises at least one encoding optical reflectivity pad configured to enable identification of information relating to the patient interface, and wherein an open slot (38) in the top surface of the housing (15) separates the first top surface portion (30) and the second top surface portion (35), **characterised in that**:

      the open slot (38) in the top surface of the housing (15) is configured to receive an optical isolation wall (57) of the oxygen delivery control device (49), the first top surface portion (30) having a larger width than a width of the second top surface portion (35); and
      wherein the second top surface portion (35) of the housing (15) comprises a chamfer (40) proximal to the open slot (38), the chamfer (40) configured to enable measurement of a depth of the housing (15) within the oxygen delivery control device (49).

2. The connector (10) of claim 1, wherein the first lumen (20) is configured to receive a standard clinical oxygen barb connector.

3. The connector (10) of claim 1, wherein the second lumen (24) cannot receive a standard clinical oxygen barb connector.

4. The connector (10) of claim 1, wherein the information relating to the patient interface comprises at least one of a type of patient interface and a size of patient interface.

5. The connector (10) of claim 4, wherein the type of patient interface is selected from at least one of a nasal cannula, a CPAP mask, an auxiliary oxygen tube, and a drug nebulizer.

6. The connector (10) of claim 4, wherein the size of patient interface is selected from at least one of adult, pediatric, and neonatal.

7. The connector (10) of claim 1, wherein the at least one encoding optical reflectivity pad is configured to cause a software constraint for the oxygen delivery control device when the at least one encoding optical reflectivity pad is inserted into the oxygen delivery control device (49).

8. The connector (10) of claim 7, wherein the software constraint comprises at least one of a maximum oxygen flow, a minimum oxygen flow, a minimum mask pressure, a maximum mask pressure, and a maximum oxygen pulse frequency.

9. The connector (10) of claim 1, wherein the chamfer (40) is configured to cause an alarm output on the oxygen delivery control device (49) when the chamfer (40) is partially inserted into the oxygen delivery control device (49) for a predetermined amount of time.

10. The connector (10) of claim 1, further comprising a third lumen (27), the third lumen (27) having a diameter smaller than the diameter of the first lumen (20).

11. A method for connecting a patient interface to an oxygen delivery control device (49), the method comprising:

selecting the connector (10) of claim 1;
selecting the oxygen delivery control device (49), the oxygen delivery control device (49) comprising a receptacle (48) to receive at least a portion of the housing of the connector (10), the receptacle (48) having an isolation wall (57) formed therein, and the oxygen delivery control device (49) further comprising at least two optical sensors (62) proximal to the receptacle (48); and
inserting the housing of the connector (10) into the receptacle (48) of the oxygen delivery control device (49).

12. The method of claim 11, wherein the top surface of the housing (15) extends from a first side to a second side and the open slot (38) in the top surface of the housing (15) is positioned closer to the second side of the housing (15).

Patentansprüche

1. Konnektor (10) zum Verbinden einer Patientenschnittstelle (47) mit einer Sauerstoffzufuhrsteuerungsvorrichtung (49), wobei der Konnektor (10) folgendes umfasst:

ein erstes Lumen (20), um Drucksauerstoff von einer Drucksauerstoffquelle in Verbindung mit der Sauerstoffzufuhr-Steuervorrichtung (49) zu der Patientenschnittstelle (47) zu leiten;
ein zweites Lumen (24) zum Messen des Atemdrucks des Patienten, wobei das zweite Lumen (24) einen kleineren Durchmesser als das erste Lumen (20) aufweist;
wobei das erste (20) und das zweite (24) Lumen in einem Gehäuse (15) umschlossen sind, wobei das Gehäuse (15) eine Oberseite aufweist, wobei die Oberseite einen ersten Oberseitenabschnitt (30) und einen zweiten Oberseitenabschnitt (35) aufweist, wobei der erste Oberseitenabschnitt (30) des Gehäuses mindestens ein kodierendes optisches Reflexionspad umfasst, das ausgebildet ist, um eine Identifikation von Informationen in Bezug auf die Patientenschnittstelle zu ermöglichen, und wobei ein offener Schlitz (38) in der Oberseite des Gehäuses (15) den ersten Oberseitenabschnitt (30) und den zweiten Oberseitenabschnitt (35) trennt, **dadurch gekennzeichnet, dass**:

der offene Schlitz (38) in der Oberseite des Gehäuses (15) ausgebildet ist, um eine optische Isolationswand (57) der Sauerstoffzufuhrsteuerungsvorrichtung (49) aufzunehmen, wobei der erste Oberseitenabschnitt (30) eine größere Breite aufweist als eine Breite des zweiten Oberseitenabschnitts (35); und
wobei der zweite Oberseitenabschnitt (35) des Gehäuses (15) proximal zu dem offenen Schlitz (38) eine Abschrägung (40) umfasst, wobei die Abschrägung (40) ausgebildet ist, um die Messung einer Tiefe des Gehäuses (15) innerhalb der Sauerstoffzufuhrsteuerungsvorrichtung (49) zu ermöglichen.

2. Konnektor (10) nach Anspruch 1, wobei das erste Lumen (20) ausgebildet ist, um einen standardmäßigen klinischen Sauerstoff-Stabkonnektor aufzunehmen.

3. Konnektor (10) nach Anspruch 1, wobei das zweite Lumen (24) keinen standardmäßigen klinischen Sauerstoff-Stabkonnektor aufnehmen kann.

4. Konnektor (10) nach Anspruch 1, wobei die Information in Bezug auf die Patientenschnittstelle mindestens einen Typ der Patientenschnittstelle und eine Größe der Patientenschnittstelle umfasst.

5. Konnektor (10) nach Anspruch 4, wobei der Typ der

Patientenschnittstelle ausgewählt ist aus mindestens einem von einer Nasenkanüle, einer CPAP-Maske, einem Hilfssauerstoffschlauch und einem Medikamentenzerstäuber.

6. Konnektor (10) nach Anspruch 4, wobei die Größe der Patientenschnittstelle aus mindestens einer von Erwachsenen, Kindern und Neugeborenen ausgewählt ist.

7. Konnektor (10) nach Anspruch 1, wobei das mindestens eine kodierende optische Reflexionspad ausgebildet ist, um eine Softwarebeschränkung für die Sauerstoffzufuhrsteuerungsvorrichtung zu bewirken, wenn das mindestens eine kodierende optische Reflexionspad in die Sauerstoffzufuhrsteuerungsvorrichtung (49) eingeführt wird.

8. Konnektor (10) nach Anspruch 7, wobei die Softwarebeschränkung mindestens einen von einem maximalen Sauerstoffffluss, einem minimalen Sauerstoffffluss, einem minimalen Maskendruck, einem maximalen Maskendruck und einer maximalen Sauerstoffpulsfrequenz umfasst.

9. Konnektor (10) nach Anspruch 1, wobei die Abschrägung (40) ausgebildet ist, um eine Alarmausgabe an der Sauerstoffzufuhrsteuerungsvorrichtung (49) zu bewirken, wenn die Abschrägung (40) teilweise in die Sauerstoffzufuhrsteuerungsvorrichtung (49) für eine vorbestimmte Zeitdauer eingeführt ist.

10. Konnektor (10) nach Anspruch 1 umfassend ferner ein drittes Lumen (27), wobei das dritte Lumen (27) einen Durchmesser aufweist, der kleiner ist als der Durchmesser des ersten Lumens (20).

11. Verfahren zum Verbinden einer Patientenschnittstelle mit einer Sauerstoffzufuhrsteuerungsvorrichtung (49), wobei das Verfahren umfasst:

Auswählen des Konnektors (10) nach Anspruch 1;
Auswählen der Sauerstoffzufuhrsteuerungsvorrichtung (49), wobei die Sauerstoffzufuhrsteuerungsvorrichtung (49) eine Aufnahme (48) umfasst, um mindestens einen Abschnitt des Gehäuses des Konnektors (10) aufzunehmen, wobei die Aufnahme (48) eine darin ausgebildete Isolationswand (57) aufweist und die Sauerstoffzufuhrsteuerungsvorrichtung (49) ferner mindestens zwei optische Sensoren (62) proximal zur Aufnahme (48) umfasst; und
Einführen des Gehäuses des Konnektors (10) in die Aufnahme (48) der Sauerstoffzufuhrsteuerungsvorrichtung (49).

12. Verfahren nach Anspruch 11, wobei sich die Oberseite des Gehäuses (15) von einer ersten Seite zu einer zweiten Seite erstreckt und der offene Schlitz (38) in der Oberseite des Gehäuses (15) näher an der zweiten Seite des Gehäuses (15) angeordnet ist.

Revendications

1. Un connecteur (10) pour connecter une interface patient (47) à un dispositif de contrôle de distribution d'oxygène (49), le connecteur (10) comprenant :

une première lumière (20) pour transmettre de l'oxygène sous pression à partir d'une source d'oxygène sous pression en relation avec le dispositif de contrôle de distribution d'oxygène (49) vers l'interface patient (47) ;
une seconde lumière (24) pour mesurer la pression respiratoire du patient, la seconde lumière (24) ayant un diamètre plus petit que la première lumière (20) ;
dans lequel la première (20) et la seconde (24) lumières sont enfermées dans un boîtier (15), le boîtier (15) ayant une surface supérieure, la surface supérieure comprenant une première partie de surface supérieure (30) et une seconde partie de surface supérieure (35), dans lequel la première partie de surface supérieure (30) du boîtier comprend au moins un coussinet de réflectivité optique de codage configuré pour permettre l'identification des informations relatives à l'interface patient, et dans lequel une fente ouverte (38) dans la surface supérieure du boîtier (15) sépare la première partie de surface supérieure (30) et la seconde partie de surface supérieure (35), **caractérisée en ce que** :

la fente ouverte (38) dans la surface supérieure du boîtier (15) est configurée pour recevoir une paroi d'isolation optique (57) du dispositif de contrôle de distribution d'oxygène (49), la première partie de surface supérieure (30) ayant une largeur plus grande qu'une largeur de la deuxième partie de surface supérieure (35) ; et
dans lequel la deuxième partie de surface supérieure (35) du boîtier (15) comprend un chanfrein (40) proximal à la fente ouverte (38), le chanfrein (40) configuré pour permettre la mesure d'une profondeur du boîtier (15) à l'intérieur du dispositif de contrôle de distribution d'oxygène (49).

2. Le connecteur (10) de la revendication 1, dans lequel la première lumière (20) est configurée pour recevoir un connecteur de barrette d'oxygène clinique standard.

3. Le connecteur (10) de la revendication 1, dans lequel la deuxième lumière (24) ne peut pas recevoir un connecteur de barrette d'oxygène clinique standard.

4. Le connecteur (10) de la revendication 1, dans lequel les informations relatives à l'interface patient comprennent au moins un type d'interface patient et une taille d'interface patient.

5. Le connecteur (10) de la revendication 4, dans lequel le type d'interface patient est choisi parmi au moins une canule nasale, un masque CPAP, un tube d'oxygène auxiliaire et un nébuliseur de médicaments.

6. Le connecteur (10) de la revendication 4, dans lequel la taille de l'interface patient est choisie parmi au moins un adulte, un enfant et un nouveau-né.

7. Le connecteur (10) de la revendication 1, dans lequel le au moins un coussinet de réflectivité optique de codage est configuré pour provoquer une contrainte software pour le dispositif de contrôle de distribution d'oxygène lorsque le au moins un coussinet de réflectivité optique de codage est inséré dans le dispositif de contrôle de distribution d'oxygène (49).

8. Le connecteur (10) de la revendication 7, dans lequel la contrainte software comprend au moins l'un de un flux d'oxygène maximum, un flux d'oxygène minimum, une pression de masque minimum, une pression de masque maximum, et une fréquence d'impulsion d'oxygène maximum.

9. Le connecteur (10) de la revendication 1, dans lequel le chanfrein (40) est configuré pour provoquer une sortie d'alarme sur le dispositif de contrôle de distribution d'oxygène (49) lorsque le chanfrein (40) est partiellement inséré dans le dispositif de contrôle de distribution d'oxygène (49) pendant une durée prédéterminée.

10. Le connecteur (10) de la revendication 1, comprenant en outre une troisième lumière (27), la troisième lumière (27) ayant un diamètre inférieur au diamètre de la première lumière (20).

11. Un procédé pour connecter une interface patient à un dispositif de contrôle de distribution d'oxygène (49), le procédé comprenant :

choisir le connecteur (10) de la revendication 1 ;
choisir le dispositif de contrôle de distribution d'oxygène (49), le dispositif de contrôle de distribution d'oxygène (49) comprenant un réceptacle (48) pour recevoir au moins une partie du boîtier du connecteur (10), le réceptacle (48) ayant une paroi d'isolation (57) formée à l'intérieur, et le dispositif de contrôle de distribution d'oxygène (49) comprenant en outre au moins deux capteurs optiques (62) à proximité du réceptacle (48) ; et
l'insertion du boîtier du connecteur (10) dans le réceptacle (48) du dispositif de contrôle de distribution d'oxygène (49).

12. Le procédé de la revendication 11, dans lequel la surface supérieure du boîtier (15) s'étend d'un premier côté à un deuxième côté et la fente ouverte (38) dans la surface supérieure du boîtier (15) est positionnée plus près du deuxième côté du boîtier (15).

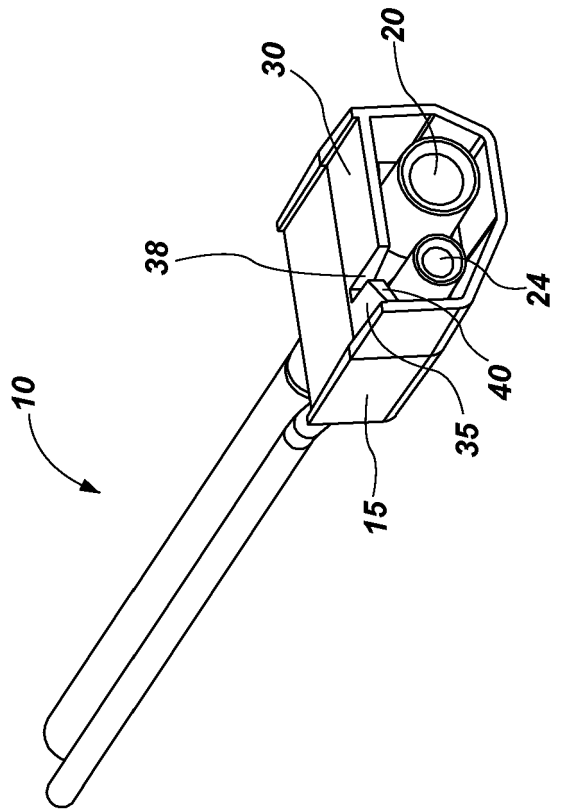
10
38
30
20
24
40
35
15

FIG. 1

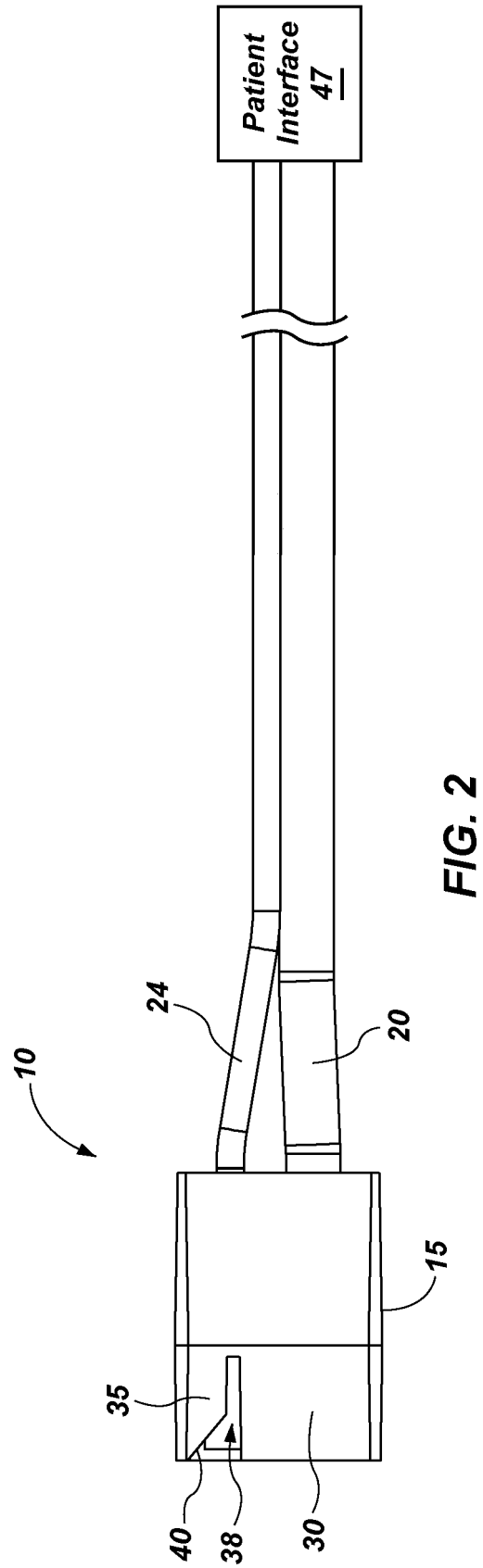
Patient Interface 47
10
24
20
15
35
40
38
30

FIG. 2

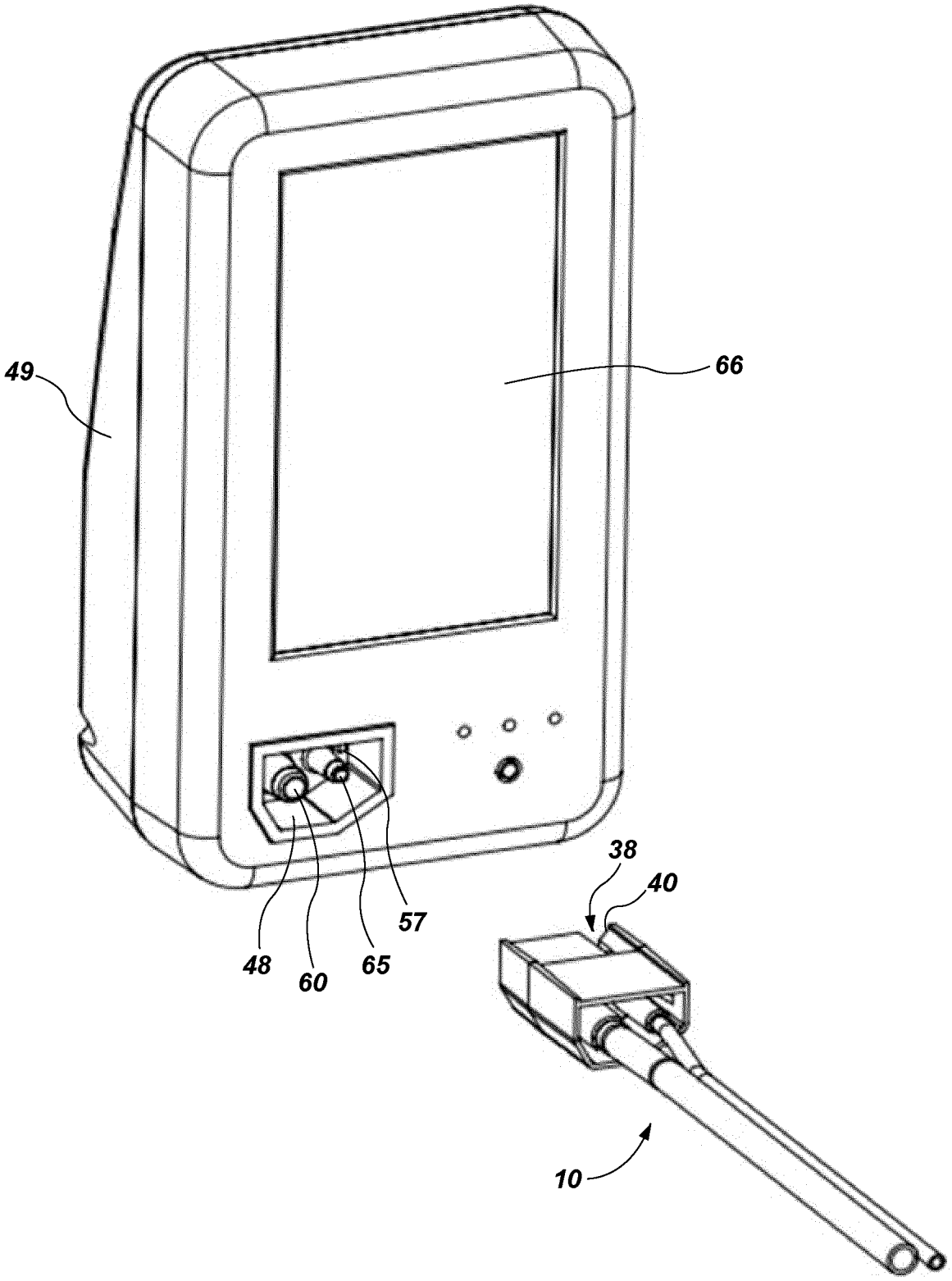

FIG. 3

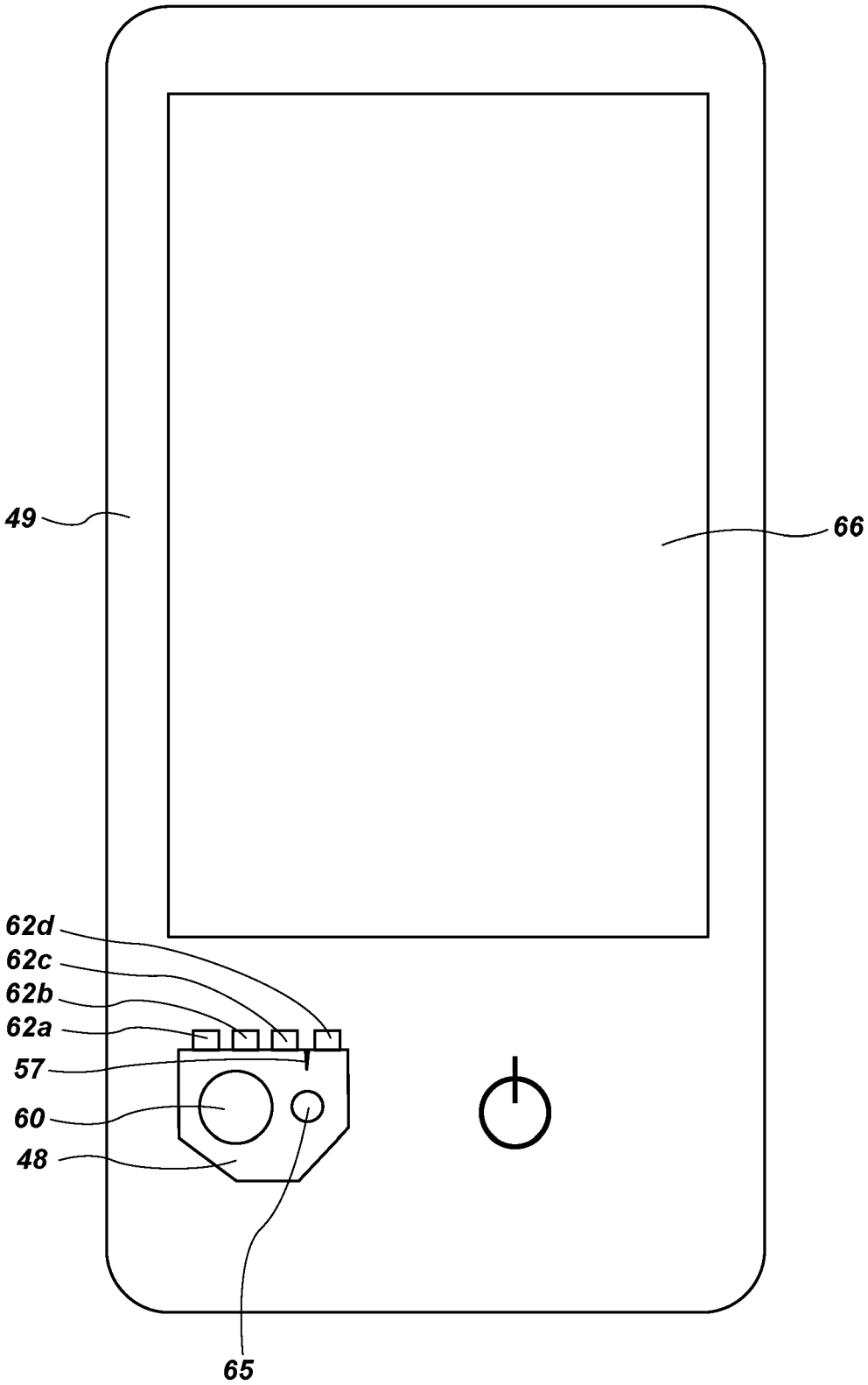

FIG. 4

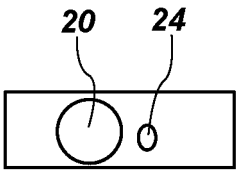

FIG. 5A

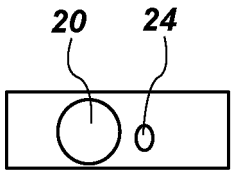

FIG. 6A

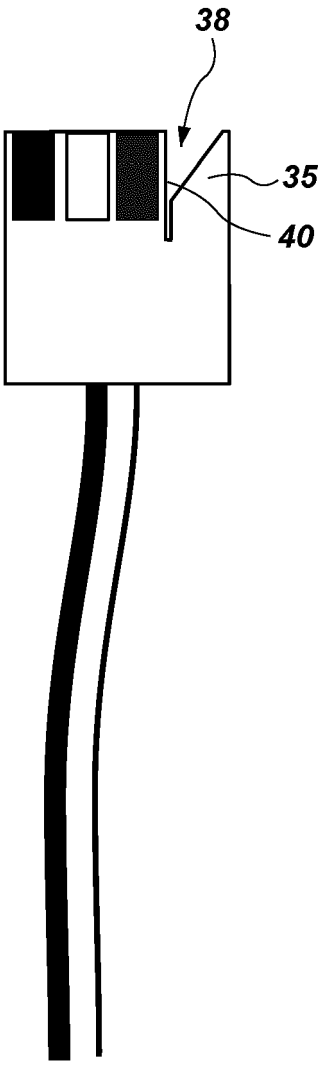

FIG. 5B

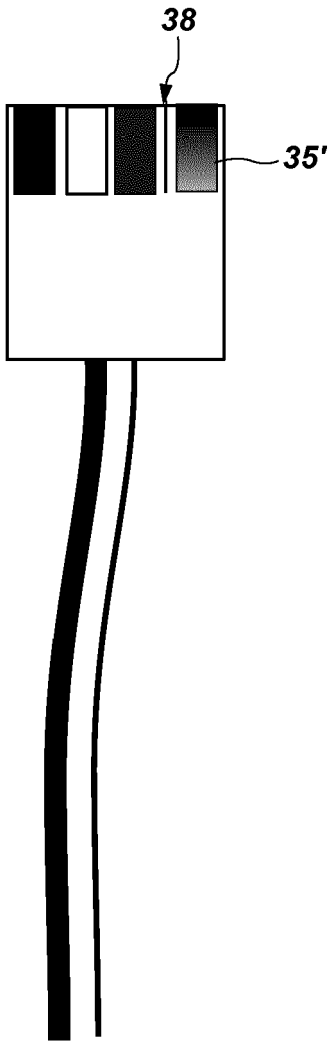

FIG. 6B

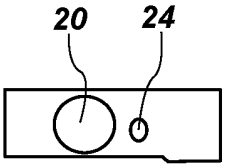

FIG. 7A

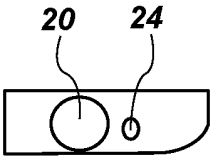

FIG. 8A

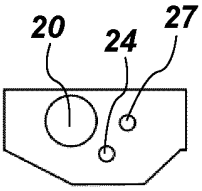

FIG. 9

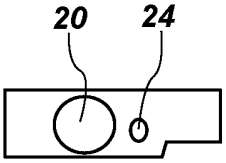

FIG. 7B

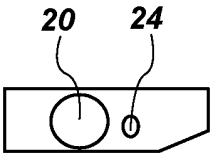

FIG. 8B

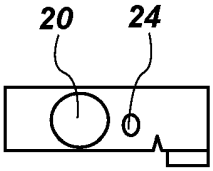

FIG. 8C

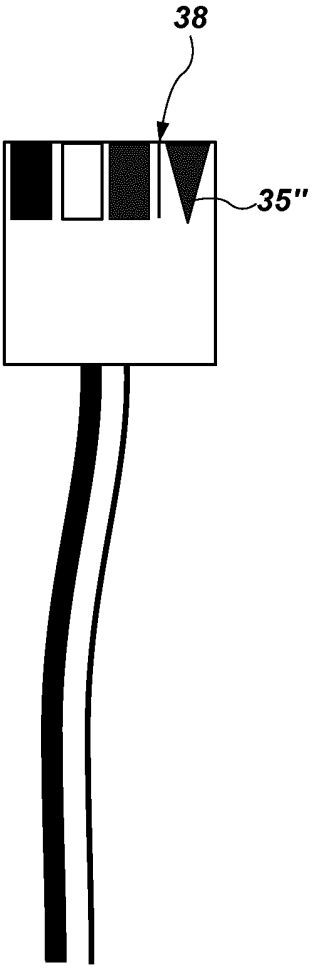

FIG. 7C

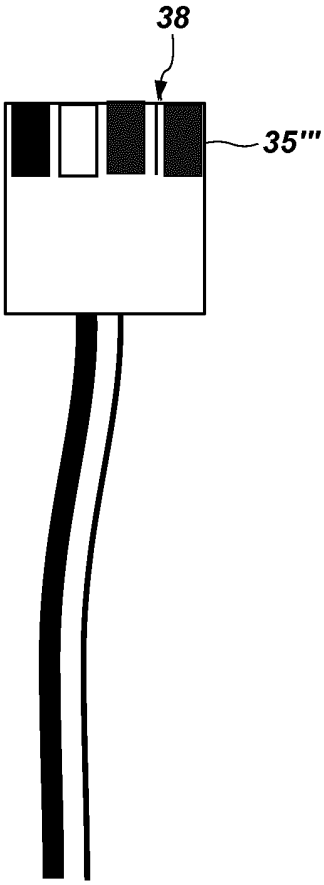

FIG. 8D

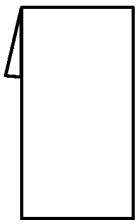

FIG. 8E

REFERENCES CITED IN THE DESCRIPTION

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- WO 2014164813 A **[0002]**