IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Payton, et al.
U.S. Patent No.: 8,186,345 Attorney Docket No.: 36784-0049IP1
Issue Date: May 29, 2012
Appl. Serial No.: 13/311,433
Filing Date: May 11, 2010
Title: APPARATUS FOR SUPPLYING GASES TO A PATIENT

Mail Stop Patent Board
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
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PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT NO. 8,186,345 PURSUANT TO 35 U.S.C. §§ 311–19, 37 C.F.R. § 42

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EXHIBIT LIST

EX. #	Exhibit Description
RMD1001	U.S. Patent No. 8,186,345 to Payton, et al. ("the '345 patent")
RMD1002	Excerpts from the File History of U.S. Patent No. 8,186,345
RMD1003	Declaration of Andrew Bath
RMD1004	U.S. Pat. Pub. No. 2003/0236015 ("Edirisuriya")
RMD1005	U.S. Pat. No. 6,272,933 ("Gradon")
RMD1006	Fisher & Paykel MR810 Respiratory Humidifier Technical Manual, Revision C ("MR810 Manual")
RMD1007	U.S. Pat. No. 5,164,652 ("Johnson")
RMD1008	UK Pat. No. 1448473 ("Grant")
RMD1009	UK Pat. No. 2173274 ("Makin")
RMD1010	U.S. Pat. No. 6,584,972 ("McPhee")
RMD1011	U.S. Pat. No. 6,078,730 ("Huddart")
RMD1012	U.S. Pub. No. 2001/0017134 ("Bahr")
RMD1013	U.S. Pat. No. 6,594,366 ("Adams")
RMD1014	U.S. Pat. No. 6,038,457 ("Barkat")
RMD1015	U.S. Pat. No. 6,384,755 ("Hayden")
RMD1016	U.S. Pat. No. 5,347,211 ("Jakubowski")
RMD1017	U.S. Pat. No. 5,428,752 ("Goren")
RMD1018	Excerpts from the File History of U.S. Patent No. 8,453,641
RMD1019	[RESERVED]

EXHIBIT LIST

RMD1020	Fisher & Paykel Healthcare, Annual Report 2003, accessed from https://www.fphcare.co.nz/files/documents/investor-announcements/annual-interim-reports-_-en/ar2003_full/
RMD1021	Fisher & Paykel Healthcare, FY04 Full Year Overview & Update, May 24, 2004, dated on https://www.fphcare.com/investor/presentations/presentations-2004/, accessed from https://www.fphcare.com/CMSPages/GetFile.aspx?guid=50c66a57-cb04-4e4d-b220-92e371d07292
RMD1022	Fisher & Paykel Healthcare, Full Year Analyst Briefing, June 5, 2002, dated on https://www.fphcare.com/investor/presentations/presentations-2002/, accessed from https://www.fphcare.com/CMSPages/GetFile.aspx?guid=ef7b02d1-cc43-4d62-a1f7-494be1bbb2dc
RMD1023	Patent Owner's Complaint for *Fisher & Paykel Healthcare Ltd. v. ResMed Corp.*, Case No. 3:16-cv-02068-GPC-WVG (S.D. Cal.)
RMD1024	Patent Owner's Complaint for *Fisher & Paykel Healthcare Ltd. v. ResMed Corp.*, Case No. 2:16-cv-06099-R-AJW (C.D. Cal.)
RMD1025	Patent Owner's Notice of Voluntary Dismissal Without Prejudice for *Fisher & Paykel Healthcare Ltd. v. ResMed Corp.*, Case No. 2:16-cv-06099-R-AJW (C.D. Cal.)
RMD1026	Petitioners' Complaint for *ResMed Inc., et al. v. Fisher & Paykel Healthcare Corp. Ltd., et al.*, Case No. 3:16-cv-02072-JAH-MDD (S.D. Cal.)
RMD1027	Petitioners' Notice of Voluntary Dismissal Without Prejudice for *ResMed Inc., et al. v. Fisher & Paykel Healthcare Corp. Ltd., et al.*, Case No. 3:16-cv-02072-JAH-MDD (S.D. Cal.)

EXHIBIT LIST

RMD1028	MR850 Respiratory Humidifier Instruction Sheet, Rev. G, Feb. 2004 ("MR850 Instruction Sheet")
RMD1029	U.S. Pat. No. 6,668,828 ("Figley")
RMD1030	German Pat. No. DE 103 12 881 B3 ("Gerder")
RMD1031	Certified translation of German Pat. No. DE 103 12 881 B3 ("Gerder")

I. INTRODUCTION

ResMed Inc., ResMed Corp, and ResMed Limited (collectively "ResMed" or "Petitioners") petition for *inter partes* review ("IPR") of claims 1-11 ("the challenged claims") of U.S. Patent No. 8,186,345 ("the '345 patent"), assigned to Fisher & Paykel Healthcare Limited.

The '345 patent generally relates to air delivery devices that provide pressurized breathing gases to a patient's airway as part of continuous positive airway pressure ("CPAP") treatment. CPAP treatment is a well-known therapy for patients who suffer from Obstructive Sleep Apnea (OSA). RMD1001 at 1:22-25. Like typical CPAP machines, the system described by the '345 patent includes a blower that generates pressurized air delivered to a patient via a breathing tube and a mask or nasal cannula. *Id*. at 3:3-23. A humidifier is included between the blower and the patient to humidify the air introduced into the breathing tube. *Id*. To prevent condensation in the tube, the tube is heated by a resistance heater wire. *Id*. at 3:49-60. The '345 patent describes the heater wire is "used along with an electronic circuit to determine properties of the gases supplied to the patient," such as "temperature, pressure, gas composition and humidity." *Id.* at 3:61-4:7. In particular, the '345 patent describes a sensor (e.g., thermistor or resistor) connected with the heater wire and positioned at the patient end of the breathing tube to monitor properties of the air delivered to the patient. *Id.*

The purported invention of the ’345 patent is using the breathing tube heater wire for delivering measurement signals from a sensor to the controller, and identifying a breathing tube type by measuring an impedance of the sensor through the heater wire. RMD1001 at 1:16-18; 1:50-62; 2:61-66; *see also* RMD1003 at ¶ 34. However, these features—a sensor connected with a heater wire in an air delivery device, and identification of a tube type based on a characteristic impedance—were well known at the time of the ’345 patent. In spite of this, the Examiner allowed claims in the ’345 patent directed to these features because the Examiner had an incomplete record of the prior art before him. In particular, several prior art references teaching these features were not disclosed to the Examiner, including several of Patent Owner’s own references. For example, Patent Owner (Fisher & Paykel) failed to disclose its prior art MR810 Technical Manual (“*MR810 Manual*”), which describes a controller configured to identify a breathing conduit based on a measured impedance of a heater wire circuit, and its U.S. Patent No. 6,953,354 to Edirisuriya (“*Edirisuriya*”), which describes a CPAP machine having measurement sensors in series with a heater wire such that the heater wire itself transmits measurement signals to a controller.

The challenged claims are unpatentable based on the teachings in at least the references presented in this petition. ResMed therefore requests the Board institute *inter partes* review of the challenged claims.

II. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)

ResMed Inc., ResMed Corp, and ResMed Limited are the Real Parties-in-Interest.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

ResMed Corp is currently a defendant in a pending litigation in the Southern District of California involving the '345 patent. *See Fisher & Paykel Healthcare Ltd. v. ResMed Corp.*, Case No. 3:16-cv-02068-GPC-WVG (S.D. Cal.). Patent Owner filed the complaint in this case on August 16, 2016, and alleges that ResMed infringes the '345 patent. RMD1023.

On August 15, 2016, Patent Owner both filed and dismissed (without prejudice) a complaint in the Central District of California also alleging that ResMed infringes the '345 patent. RMD1024; RMD1025.

Petitioners have also filed and dismissed (without prejudice) a complaint related to the '345 patent. On August 16, 2016, Petitioners filed a complaint in the Southern District of California alleging infringement of several patents held by Petitioners, and seeking declaratory judgment on non-infringement and invalidity of the '345 patent. RMD1026. Petitioners voluntarily dismissed this complaint without prejudice on August 18, 2016. RMD1027.

Petitioners' withdrawn action for declaratory judgment regarding the invalidity of the '345 patent has no effect under 35 U.S.C. § 315(a) because it was voluntarily dismissed without prejudice. *See Macuato U.S.A. v. BOS GmbH & KG*, IPR2012-00004, Paper No. 18 at pp. 15-16 (PTAB Jan. 24, 2013); *see also Oracle Corp., et al. v. Click-to-Call Techs. LP*, IPR2013-00312, Paper No. 52 at pp. 12-13 (PTAB Oct. 28, 2014). Additionally, Patent Owner's pending suit against Petitioners regarding the '345 patent has no effect under 35 U.S.C. § 315(b) since it was filed less than a year ago.

Petitioners are also seeking IPR of U.S. Patent Nos. 8,453,641 and 9,265,902. The '345 patent resulted from a divisional application of the application that issued as the '641 patent, and the '902 patent resulted from a continuation application of the application that issued as the '641 patent.

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioners provides the following designation of counsel.

LEAD COUNSEL	BACK-UP COUNSEL
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D. Service Information

Please address all correspondence and service to the address of both counsel listed above. Petitioners also consents to electronic service by email at IPR36784-

0049IP1@fr.com (referencing No. 36784-0049IP1 and cc'ing schaefer@fr.com and kane@fr.com).

III. PAYMENT OF FEES – 37 C.F.R. § 42.103

Petitioners authorize charging Deposit Account 06-1050 for the petition fee set in 37 C.F.R. § 42.15(a) and for any other required fees.

IV. REQUIREMENTS FOR IPR UNDER 37 C.F.R. § 42.104

A. Grounds for Standing Under 37 C.F.R. § 42.104(a)

Petitioners certify that the '345 patent is available for IPR and that Petitioners are not barred or estopped from requesting IPR.

B. Challenge Under 37 C.F.R. § 42.104(b) and Relief Requested

Petitioners request IPR of the challenged claims on the Grounds listed in the table below. An explanation of how these claims are unpatentable under the statutory Grounds identified below is provided in the form of detailed description and charts that follow, indicating where each element can be found in the cited prior art, and the relevance of that prior art. Additional explanation and support for each Ground of rejection is set forth in Exhibit RMD1003, the declaration of Andrew Bath, referenced throughout this Petition.

Ground	Claims	Basis for Rejection
1	1-2 and 4-11	Anticipated by *MR810 Manual*
2	1-3 and 5-11	Obvious over *MR810 Manual*, *Gradon, Edirisuriya*, and *Figley*

3	1-11	Obvious over *MR810 Manual*, *Gradon, Edirisuriya*, and *Johnson*

The ’345 patent issued from U.S. App. No. 12/777,370, (the ’370 Application) filed May 11, 2010, which is a divisional of U.S. App. No. 11/572,822, filed on October 18, 2007, which is a national stage entry under 371(c) of PCT/NZ2005/000219, filed on August 19, 2005, which claims priority to NZ534853, filed on August 20, 2004. Petitioners expressly reserve the right to argue the priority date in this proceeding or other proceedings involving the ’345 patent.

The *MR810 Manual* was published in April 2004, more than one year before the filing of PCT/NZ2005/000219. Therefore, the *MR810 Manual* qualifies as prior art at least under 35 U.S.C. § 102(b). The publication date establishing the *MR810 Manual* as prior art under § 102(b) is further evidenced by the following:

- The *MR810 Manual* is dated April 2004 as the “Date Issued.” *MR810 Manual* at p. 6.

Revision	Description of Change	Date Issued
A	First release.	May 2002
B	Spare parts list updated. Removed PCB component list.	October 2002
C	Updated for Rev B PCB. Removed PCB schematic and component layout. Reformatting.	April 2004

MR810 Manual, Technical Manual Revision History, p. 6

- Patent Owner indicated in the *Fisher & Paykel Healthcare, Annual Report 2003*, that the "MR810 Oxygen Therapy Humidification System" was one of its "New Products Introduced in the Last 12 Months." RMD1020 at p. 16.
- Patent Owner described the "MR810 Respiratory Humidifier" as a "new" product in the Fisher & Paykel Healthcare "FY04 Full Year Overview and Update" presentation dated May 24, 2004. RMD1021 at p. 8.
- Patent Owner described the "MR810 Humidifier" as being introduced in "Next 6-12 months" in the Fisher and Paykel "Third Quarter Investor Meetings" presentation dated Feb. 25, 2002. RMD1022 at p. 17.

Edirisuriya (U.S. Pat. Pub. No. 2003/0236015) is assigned to Patent Owner and published on Dec. 25, 2003, more than one year before the filing of PCT/NZ2005/000219. Therefore, *Edirisuriya* qualifies as prior art at least under 35 U.S.C. § 102(b).

Gradon (U.S. Pat. No. 6,272,933) is assigned to Patent Owner and issued on August 14, 2001, more than one year before the filing of PCT/NZ2005/000219. Therefore, *Gradon* qualifies as prior art at least under 35 U.S.C. § 102(b).

Johnson (U.S. Pat. No. 5,164,652) issued on November 17, 1992, more than one year before the filing of PCT/NZ2005/000219. Therefore, *Johnson* qualifies as prior art at least under 35 U.S.C. § 102(b).

V. STATE OF THE ART BEFORE THE '345 PATENT

The features described in the '345 patent and recited in the challenged claims were well known in the art at the time of the '345 patent. In particular, the state of the art already included heated air delivery tubes, resistor wires, distal temperature sensors, electrical sensor connections, identification elements having a characteristic impedance, automatic component identification, and combinations of these features at the time of the '345 patent. Patent Owner's technology was nothing more than a collection of well-known components, the combinations of which were also known.

A. Air delivery tubes supplying humidified air to a patient with the tube being heated by a resistor wire were known in the art.

Air delivery tubes supplying humidified air to a patient, with the tube being heated by a resistor wire, were known in the art at the time of filing the application leading to the '345 patent. Indeed, the '345 patent indicates that a "heated tube with a heating wire" was previously described in U.S. Pat. No. 6,078,730, and that "other similar tube[s] and heating wire[s]" were also known. *See* RMD1001 at 2:66-3:2; *see also* RMD1004 at ¶ [0002]; RMD1005 at 8:3-7; RMD1008 at p. 1, l. 75-80; RMD1009 at p. 2.

B. The use of a "distal" temperature sensor (e.g., a thermistor) located in the airway near the patient end of the tube, to provide feedback, was known in the art.

The use of a distal temperature sensor, such as a thermistor, located in the airway near the patient end of the tube to provide feedback to a controller was known in the art at the time the application leading to the '345 patent was filed. Indeed, the '345 patent identifies three prior art references—*Gradon*, U.S. Pat. No. 6,584,972 to McPhee, and U.S. Pat. No. 6,078,730 to Huddart—as each describing temperature probes positioned at the patient end of a breathing tube to provide feedback signals to a controller. *See, e.g.,* RMD1005 at FIG. 5; 8:19-42 ("[A] temperature probe 17 may be provided at or near the patient to indicate the gases temperature being received by the patient."); RMD1010 at FIG. 1; RMD1011 at FIG. 11; *see also* RMD1009 at p. 2; RMD1008 at p. 2, l. 52-54.

C. Electrical connection to a distal temperature sensor as part of the air delivery tube was known in the art.

An electrical connection from a controller to a distal temperature sensor provided as part of the air delivery tube was known in the art at the time the application leading to the '345 patent was filed. Here again, Patent Owner's own publication, the *Edirisuriya* reference, describes a heater wire associated with the breathing tube that serves as a transmission line to a distal sensor, and explains the disadvantages of having separate connectors for the tube and electrical wiring. *See, e.g.*, RMD1004 at Abstract, ¶¶ [0003], [0070]; *see also* RMD1012, ¶¶ [0006],

[0009]-[0010] (describing a connector for a breathing device that provides both a gas connection and an electrical connection for sensor signal transmission). *Makin* also describes an electrical connection to a distal temperature sensor as part of the delivery tube. For example, *Makin* expressly teaches a "heater cable 4" that is wound spirally around an air delivery tube. RMD1009 at pp. 3-4; *see also* RMD1003 at ¶¶ 28-33. *Makin* further describes that the "heater cable 4" includes a "silicone rubber covered wire 10" that "interconnects two temperature sensors arranged one at each end of the hose." *Id.*; *see also* RMD1031 at [0008] ("[A] separate cable connection running in addition to the breathing gas tube is avoided due [in part to] a signal line for sensor data, which runs along the length of the breathing gas tube.")

D. The use of identification elements having a characteristic impedance to identity which of a plurality of devices has been connected to a controller was a common technique used in many different art areas, including in patient air delivery devices.

The use of identification elements having a characteristic impedance to identity which of a plurality of devices has been connected to a controller was a common technique used in many different art areas, including in patient air delivery devices, at the time the application leading to the '345 patent was filed. Indeed, Patent Owner's own prior art publications, the *MR810 Manual* and *MR850 Instruction Sheet*, describe identifying a type of breathing tube connected to the humidifier based on a measured resistance. *See* RMD1006 at 3.5.1 (describing that

"[c]onnecting a heated wire breathing circuit (between 10 and 28 Ω) to the MR810 will automatically initiate the heater-wire mode of control"); RMD1028 at p. 3 (describing that "the humidifier automatically changes to heater wire mode" in response to a "heated breathing circuit" being connected). In another example, U.S. Pat. 6,668,828 to Figley describes using resistors and other means to identify components connected to respiratory devices, such as cannula connectors. *See* RMD1029 at 16:25-35.

The use of identification elements having a characteristic impedance is well known in other art areas as well. *See, e.g.,* RMD1007 at 2:64-68 ("A sensing electrical component 113 (such as a resistor, [or] a thermistor) is utilized in the present invention to provide an electrical signature indication of battery type."); RMD1013, 1:51-55; RMD1014, 1:62-65; 2:67-3:3 ("Accessory 200 includes predetermined impedance 202, which in the preferred embodiment is a resistor having a predetermined value to indicate that accessory 200 is a headset. . . . Each accessory has a different value impedance 202 enabling controller 130 to identify each accessory by comparing the value of impedance 202 to predetermined values."); RMD1015, 1:51-65, 2:61-3:7; RMD1016, 5:3-7, 6:10-12; RMD1017, 1:44-53.

E. Automatic identification of connected air supply components and system operation in accordance with the identified components was known in the art.

Automatically identifying which of a plurality of different air delivery tubes has been interconnected, and the operation of the humidification system in accordance with that identification, was known in the art at the time the application leading to the ’345 patent was filed. Here again, Patent Owner’s own prior art publications, the *MR810 Manual* and *MR850 Instruction Sheet*, describe a humidifier that automatically identifies whether a “heated breathing circuit” or an “unheated breathing circuit,” and controls the humidifier accordingly. RMD1006 at FIG. 3.2, 3.4; 3.4.4, 3.5.1, 3.5.2 (describing that “[c]onnecting a heated wire breathing circuit (between 10 and 28 Ω) to the MR810 will automatically initiate the heater-wire mode of control,” that “[i]f no heater-wire is detected, the MR810 initiates non heater-wire mode.”); RMD1028 at p. 3 (describing that “the humidifier automatically changes to heater wire mode” in response to a “heated breathing circuit” being connected).

VI. SUMMARY OF THE ’345 PATENT

A. Ignoring prior art solutions, the ’345 patent purports to solve the problem of external wires connecting a distal sensor to a controller.

The’345 patent purports to solve a problem that had already been solved in the prior art. In particular, the ’345 patent suggests systems having external wires

that "run down the outside of the breathing tube" present risks of user installation error and "vulnerability" of the exposed wires, but that "external wires for sensing gas properties" were "required by the prior art." *See, e.g.,* RMD1001 at 1:31-43; 5:58-60. Prior art systems that described solutions to such problems, however, were common in the art, including in Patent Owner's own publications. RMD1003 at 27. Indeed, Patent Owner's *Edirisuriya* reference describes disadvantages associated with "external wires," and teaches a breathing tube having non-external wiring and a single connector that provides both a pneumatic connection and an electrical connection for the electrical wire extending through the conduit. *See* RMD1004 at ¶¶ [0002]-[0003], [0005], [0070].

B. The specification and claims are directed to identifying an attached conduit using an "identification element."

Like well-known CPAP systems, the '345 patent describes a system having four main parts: a blower that forces air through the system; a humidifier that adds water vapor to the air; a heated tube that conveys the humidified air; and a mask or nasal cannula that delivers the humidified air to the patient. RMD1001 at 3:3-10; Fig. 1; RMD1003 at 24. The

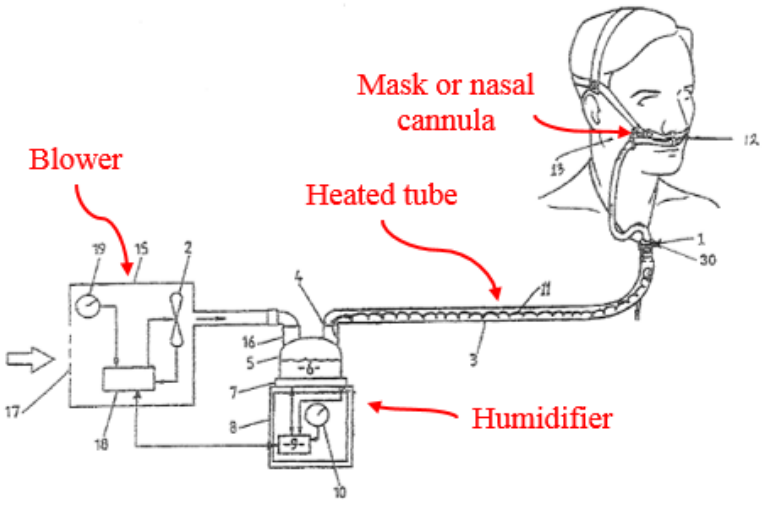


Figure 1

'345 patent, FIG. 1 (annotated)

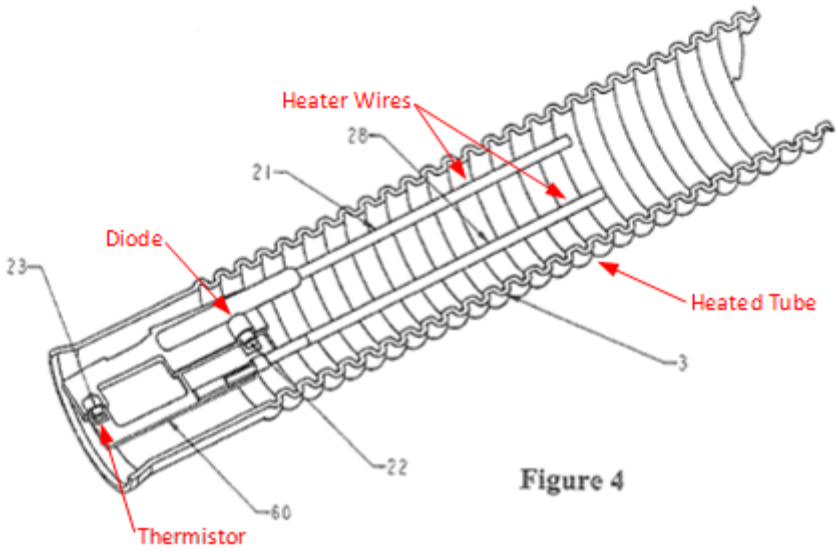
breathing tube is heated by a resistance heating wire within the tube to maintain the temperature of air flowing through the tube and reduce condensation, and a thermistor temperature sensor is positioned near the patient end of the breathing tube that provides a feedback to the controller. *See, e.g.,* RMD1001 at 3:49-60; *see also* RMD1003 at ¶ 25.

The claims of the ’345 patent are directed to identifying the type of breathing tube connected using an “identification element” connected with the heater wire. *See, e.g.,* RMD1001 at 4:52-62. In particular, the ’345 patent describes a “thermistor 23” used to monitor the temperature of humidified gases flowing to the patient through the conduit, and that the “thermistor’s value can be chosen to have different resistance curves with known properties at ambient temperature.” RMD1001 at 4:52-54; RMD1003 at 26. “The choice of a particular thermistor value for use with the circuit allows identification by the control system . . . and matching of that thermistor value with a specific conduit or tubing 3,” so the control system can “apply the appropriate control strategy to the heating of the conduit.” *Id.* at 4:54-62.

The ’345 patent’s purported improvement over the prior art is thus using the non-external heater wire for delivering measurement signals from the thermistor to the controller (e.g., instead of using an external wire connected between the sensor and controller), and detecting a “characteristic impedance” of the sensor through

the heater wire to identify the type of breathing tube connected to the system. *See, e.g.*, *id*. at 5:58-6:4; RMD1003 at ¶ 27.

To this end, the ’345 patent describes an electrical circuit including a thermistor connected in series with heater wires that heat the breathing tube. *Id*. at 4:14-23; Fig. 4 (annotated below). The humidifier controller is said to measure the impedance of the thermistor and, based on the measured impedance, identify the breathing tube type. *Id*. at 4:23-29, 4:53-62. Accordingly, claims of the ’345 patent refer to a thermistor as an “identification element” having a “characteristic impedance.” *Id*. at Claims 1 and 8.



’345 patent, FIG. 4 (annotated)

C. Prosecution history of the parent application and the divisional that became the ’345 Patent.

The ’370 application leading to the ’345 patent was filed May 11, 2010, as a divisional of U.S. Pat. App. No. 11/572,822 (“the ’822 Application”).

The parent ‘822 application, was allowed based on features disclosed in Patent Owner’s own references that were not disclosed to the Examiner. In particular, over the course of three office actions, Patent Owner amended the

claims several times and argued that the claims were allowable because the claims "relate to using the heater wire as a communication link through which information from a sensor in one portion of an electrical circuit can be passed to another distant portion of the electrical circuit." RMD1018 at p. 34. However, this feature is described in Patent Owner's own *Edirisuriya* reference, which Patent Owner did not disclose to the Examiner. RMD1004 at ¶ [0070] (describing using "the heater wire itself . . . to carry electrical signals from measuring sensors"). With an incomplete record before him, the Examiner issued a notice of allowance in response to Patent Owner's remarks and amendments. The Examiner provided no statement of reasons for allowance and the '822 application issued as U.S. Pat. No. 8,453,641.

No prior art rejections were entered during prosecution of the '370 application which resulted in the issuance of the '345 patent. Instead, the Examiner allowed all of the original claims as submitted and the Examiner provided no reasons for allowance. RMD1002 at 13. However, the allowance was again based on an incomplete record.

D. Person of ordinary skill in the art.

In view of the subject matter of the '345 patent, a person of ordinary skill in the art ("POSITA") as of any of the claimed priority dates as early as August 2004, would have had a bachelor's degree in electrical engineering or biomedical

engineering or related discipline with an understanding of circuit design principles, and a reasonable amount of relevant product design experience to develop a level of competence in the field of respiratory therapy, or an equivalent advanced education. *See* RMD1003 at ¶¶ 21-22. This level of knowledge and skill is applied throughout the Petition.

VII. CLAIM CONSTRUCTION UNDER 37 C.F.R. § § 42.104(B)(3)

For *inter partes* review, a claim in an unexpired patent is given its broadest reasonable construction in light of the specification in which it appears. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142-46 (2016). Claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). The constructions offered below are intended to aid this proceeding, and do not waive any arguments concerning indefiniteness or claim breadth in proceedings applying different construction standards.

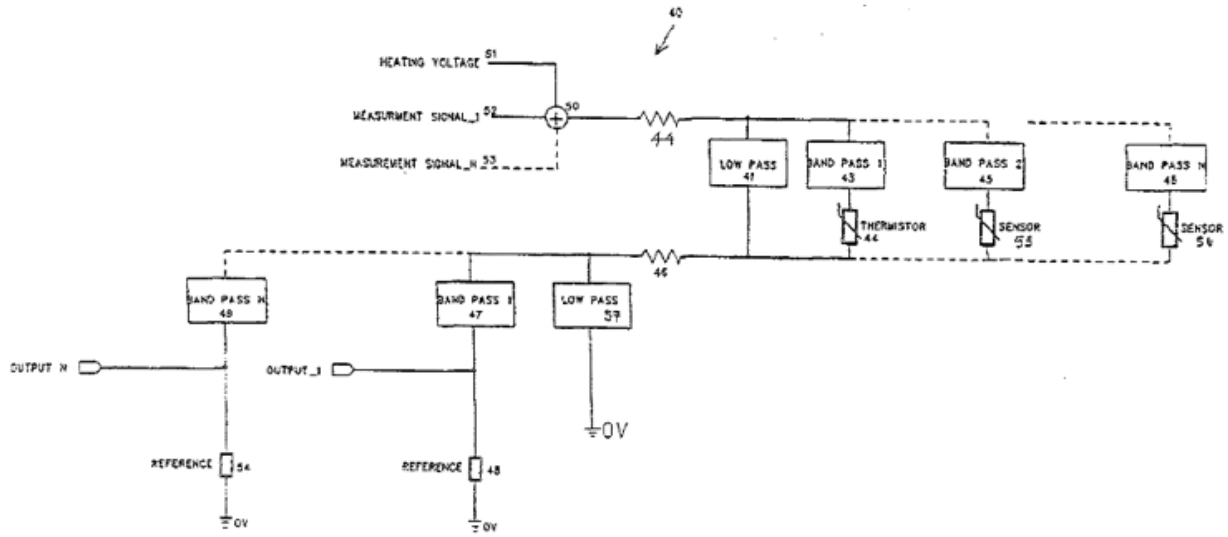
A. The "heater wire" and "identification element" limitations.

Both independent claim 1 and independent claim 8 recite "heater wire" and "identification element" limitations—nothing in the claims require the identification element be a separate component from the heater wire. *See Sun Studs, Inc. v. ATA Equipment Leasing, Inc.*, 872 F.2d 978, 989 (Fed. Cir. 1989)

(overruled on other grounds) (holding that a single structure can read on multiple different limitations if that structure provides the functionality of those limitations); *cf. Dolly, Inc. v. Spalding & Eventflo Companies, Inc.*, 16 F.3d 394, 399 (Fed. Cir. 1994). Claims 1 and 8 recite the "heater wire" and "identification element" limitations without any additional limitations that would require them to be separate structures, unlike the claims in *Dolly* which included an additional limitation codifying a structural relationship that required the limitations to be separate structures. *See Dolly*, 16 F.3d at 396, 399 (holding the recited "rigid frame" to require a different structure from the recited "seat panel" and "back panel" because the claims included a relationship that the "stable rigid frame" "provides a body supporting feature" "along with said seat panel and said back panel"). For example, claim 1 merely requires that the "heater wire" be "utilized in an electrical circuit including at least one identification element," and does not recite a relationship between the "heater wire" and the "identification element" that require them to be separate structures (e.g., the "heater wire" being utilized in the "electrical circuit" including the "identification element" does not exclude the "heater wire" being the "identification element"). Similarly, claim 8 merely requires that the "heater wire" include "an identification element," and also does not recite a relationship that would require them to be separate structures (e.g., the "heater wire including an identification element" does not exclude the

"identification element" from being part of the same physical structure the "heater wire").

This interpretation is further supported by and consistent with the '345 specification. For example, the '345 patent describes AC and DC circuit configurations in which the identification element is connected with the heater wire, and current passes through the heater wire when determining the impedance of the identification element. *See, e.g.*, RMD1001 4:17-25; 5:6-8.



'345 patent, FIG. 3

Furthermore, the '345 patent describes that "one or more of the sensing elements 55, 56 . . . could be replaced by a fixed impedance to allow identification of the tube"—explaining that the "identification element" is not limited to a sensor, but can be anything providing a fixed impedance. RMD1001 at 5:34-37. Resistance heater wires were known to have a fixed impedance, and it was known

that power was delivered to heater wires based on this fixed impedance to produce a desired heat output. *See, e.g.* RMD1011 at 3:49-58; RMD1003 at ¶ 36.

Accordingly, independent claims 1 and 8 require electrical current passing through the heater wire for measurement of the characteristic impedance of the identification element, and the claimed "identification element" and "heater wire" can be a single structure.

B. The "characteristic impedance" of the identification element may be a fixed value or a range of values.

The characteristic impedance of the "identification element" may be fixed (e.g. a particular impedance value) or a range of impedance values. Indeed, a "characteristic impedance" must be read broadly enough to cover a fixed resistance and a range of resistances because claim 3, which depends from and further limits claim 1, recites "wherein said characteristic impedance is a thermistor resistance range," and claim 4, which depends from and further limits claim 1, recites "wherein said identification element is a fixed resistor." RMD1001; 37 C.F.R. § 1.75.

VIII. CLAIMS 1-11 OF THE '345 PATENT ARE UNPATENTABLE.

As detailed below, this petition shows a reasonable likelihood that Petitioners will prevail with respect to the challenged claims of the '345 patent.

The Examiner's allowance of the challenged claims was based on an incomplete record of the prior art during prosecution. In particular, Patent Owner

never disclosed and the Examiner never considered the *MR810 Manual*, *Edirisuriya*, or *Johnson*. However, these references show the '345 patent's purported improvements related to including a heated wire circuit having a characteristic impedance within the breathing tube, and identifying a type of breathing tube connected based on the characteristic impedance. Accordingly, the challenged claims should be found unpatentable.

A. GROUND 1 – Claims 1-2 and 4-11 are unpatentable under 35 U.S.C. § 102 as anticipated by the *MR810 Manual*.

1. Overview of Patent Owner's *MR810 Manual*

The *MR810 Manual* describes a respiratory humidification system that measures an impedance of a heater wire circuit to identify a breathing tube as a "heated" type or an "unheated" type upon connection of the breathing tube. *See, e.g.*, RMD1006 at 3.1; FIG. 3.2. The basic components of the overall system described by the *MR810 Manual* are essentially the same as the '345 patent. *See, e.g.,* RMD1003 at ¶ 38. As shown in annotated FIG. 3.1 below, for example, the system described by the *MR810 Manual* includes a gas source, a humidifier that adds water vapor to gas from the gas source, and a breathing circuit that conveys the humidified air to the patient.

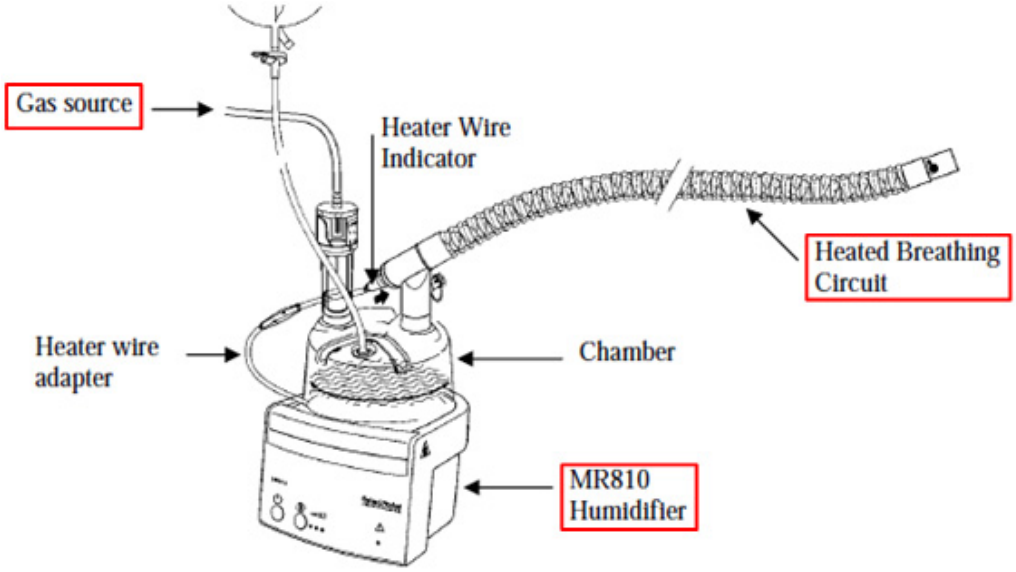


Figure 3.1: Typical setup for oxygen therapy using a heated breathing circuit

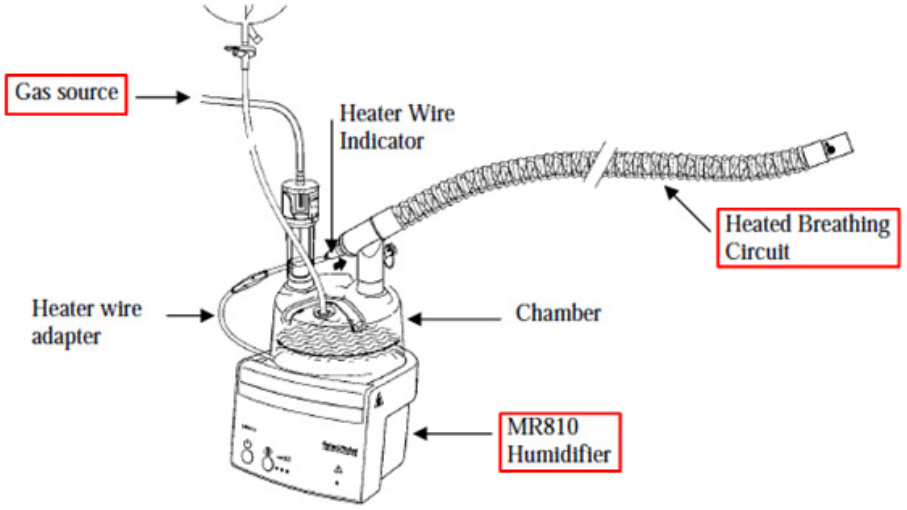
F&P MR810 Manual, FIG. 3.1 (annotated)

The *MR810 Manual* describes that its system may operate in a "heater-wire mode" when a "heated breathing circuit" (having a coiled heating wire extending along the circuit) is connected, or a "non heater-wire mode" when an "unheated breathing circuit" (in which a heating wire is not present), is connected to the humidifier. *See, e.g.*, RMD1006 at 3.5; FIGS. 3.1-3.2. The *MR810 Manual* teaches that connection of the "heated breathing circuit" automatically initiates the "heater-wire mode." *Id*. at 3.5.1. In particular, the MR810 humidifier measures the impedance of the heated wire circuit and compares the measurement to predetermined impedances. *Id*. If a "heated breathing circuit" is identified based on a measured impedance "between 10 and 28 Ω," the device initiates the "heater-wire mode of control" to apply power to the heater wire. *Id.*; *see also* FIG. 3.4

(showing "heater wire power" applied to the heater wire when in "heater wire mode of control"). If an impedance is measured within predetermined ranges of less than 10 Ω or greater than 28 Ω, the circuit is identified as an "unheated breathing circuit" and the device operates in the "non heater-wire mode of control." *Id*. at 3.5.2.

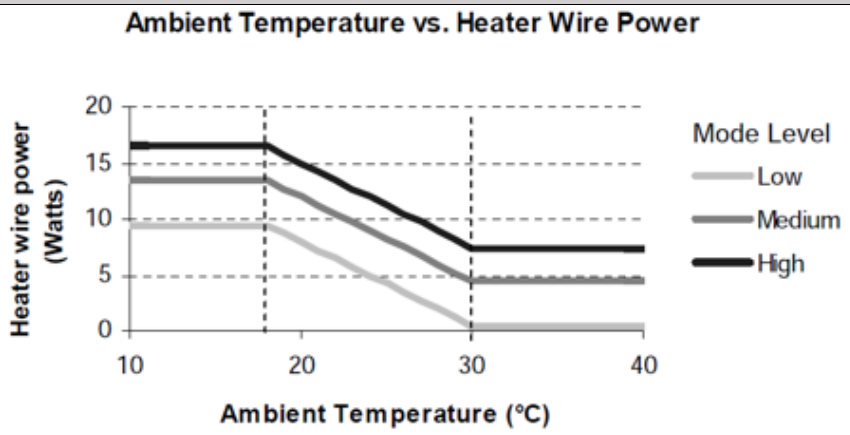
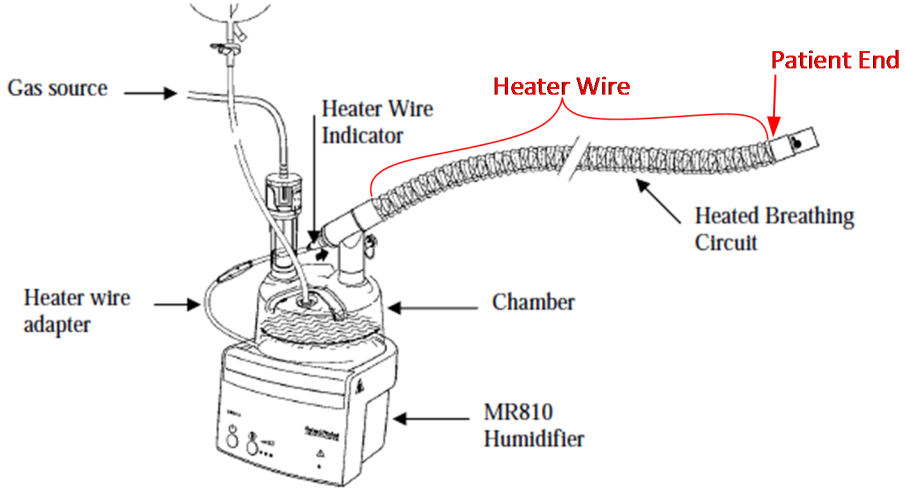
2. The *MR810 Manual* discloses all of the limitations of claims 1-2 and 4-11.

The following claim chart sets forth in detail exemplary disclosure from the *MR810 Manual* showing how this prior art reference discloses each element of claims 1-2 and 4-11. Notably, the language of independent claims 1 and 8 do not require an identification element provided as a component in addition to the heater wire that serves to heat the conduit. As discussed above, claim 1 recites a "heater wire . . . utilized in an electrical circuit including at least one identification element," and claim 8 recites a "heater wire including an identification element," indicating the identification element may be part of the heater wire, separate from the heater wire, or the heater wire itself. *See* VII.A., *supra*. The *MR810 Manual*, which teaches measuring an impedance of a heater wire circuit, necessarily includes measuring a characteristic impedance of the identification element provided by the heater wire circuit. *See* VIII.C.1., *supra*.

’345 Patent Claims	Exemplary Disclosure of the *MR810 Manual*
[1.1] An apparatus for supplying gases to a patient comprising:	The *MR810 Manual* discloses an apparatus for supplying gases to a patient. *See, e.g.,* RMD1006 at 3.1; FIG. 3.1. The *MR810 Manual* describes the “MR810 Respiratory Humidifier is designed to heat and humidify respiratory gases delivered to the patient via a face, nasal, or oral mask. The inspired gas is passed through the chamber of water where it is heated and humidified. An optional heated breathing circuit (heated via a wire inside the circuit), can be used to minimise condensate in the breathing circuit and maximize humidity delivery to the patient.” *Id*. at 3.1.
[1.2] a gases supply,	The *MR810 Manual* discloses a gases supply provided by a “gas source.” *See, e.g.*, RMD1006 at FIGS. 3.1-3.2.  **Figure 3.1: Typical setup for oxygen therapy using a heated breathing circuit** **F&P MR810 Manual, FIG. 3.1 (annotated)**
[1.3] a delivery conduit including a heater wire for heating said conduit,	The *MR810 Manual* discloses a delivery conduit including a heater wire for heating the conduit provided by a “heated breathing circuit (heated via a wire inside the circuit).” *See, e.g.*, RMD1006 at 3.1; FIG. 3.1.
[1.4] wherein said heater wire is located within, around	The *MR810 Manual* discloses that the heater wire is located within, around or throughout the conduit. *See, e.g.*, RMD1006 at 3.1; FIG. 3.1 (teaching the heated breathing circuit is “heated via a wire inside the circuit.”).

’345 Patent Claims	Exemplary Disclosure of the *MR810 Manual*
or throughout said conduit	
[1.5] and utilized in an electrical circuit including at least one identification element having a characteristic impedance,	The *MR810 Manual* discloses a heater wire utilized in an electrical circuit including at least one identification element having a characteristic impedance. The *MR810 Manual* describes an identification element provided by the “heated wire circuit” that includes a characteristic impedance that can be used to identify a type of breathing tube connected to the system. *See* RMD1006 at 3.4.4; RMD1003 at ¶¶ 39-44. The *MR810 Manual* teaches its heated wire circuit serves as an identification element having a characteristic impedance “between 10 and 28 Ω.” RMD1006 at 3.5.1.
[1.6] a controller for controlling the heating of the heater wire	The *MR810 Manual* discloses a controller for controlling the heating of the heater wire. For example, the *MR810 Manual* teaches the “humidifier applies power to the heater-wire circuit dependent on the ambient temperature and the mode selected,” and describes operation of a “heater-wire mode of control” and an ambient temperature sensor that measure ambient air temperature for “controlling the heating of the heated wire breathing circuits,” indicating the humidifier includes a controller for controlling the heating of the heater wire. *See, e.g.*, RMD1006 at 3.4.5; 3.5.1.
[1.7] and wherein said controller is adapted to measure said characteristic impedance of said identification element	The *MR810 Manual* discloses wherein the controller is adapted to measure the characteristic impedance of the identification element. The *MR810 Manual* describes that its device identifies which type of breathing circuit is connected, and whether to initiate the heater-wire mode of control, based on a measured impedance of the heated wire circuit. *See,* RMD1006 at FIG. 3.2; 3.5.1; RMD1003 at ¶¶ 39-43. For example, the *MR810 Manual* states that “[c]onnecting a heated wire breathing circuit (between 10 and 28 Ω) to the MR810 will automatically initiate the heater-wire mode of control,” indicating that the MR810 controller measures the impedance of the heated wire circuit. RMD1006 at FIG. 3.2; 3.5.1. The system described by the *MR810 Manual* then identifies the type of breathing circuit that is connected, and whether to initiate the

’345 Patent Claims	Exemplary Disclosure of the *MR810 Manual*
	“heater-wire mode of control,” by comparing the measured impedance to predetermined ranges (e.g. “between 10 and 28 Ω”). *Id.*
[1.8] and identify said delivery conduit based on said characteristic impedance	The *MR810 Manual* discloses a humidifier controller configured to identify a delivery conduit based on the characteristic impedance of the identification element. *See* RMD1006 at 3.5.1; RMD1003 at ¶¶ 39-43. The MR810 device identifies a conduit as either a “heated breathing circuit” or an “unheated breathing circuit” by comparing the measured characteristic impedance to predetermined ranges: “Connecting a heated wire breathing circuit (between 10 and 28 Ω) to the MR810 will automatically initiate the heater-wire mode of control.” *Id. at* FIG. 3.2; 3.5.1; *see also* Ground 1, [1.6]-[1.7], *supra*.
[1.9] and to apply power to said heater wire based at least in part on the identified conduit.	The *MR810 Manual* discloses applying power to a heater wire based at least in part on the identified conduit. *See* RMD1006 3.5.1; FIG. 3.4; Ground 1, [1.6]-[1.7], *supra*; RMD1003 at ¶¶ 41, 45. For example, FIG. 3.4 of the *MR810 Manual* illustrates an example of the applied “heater wire power” when the conduit is identified as a “heated breathing circuit” and the system initiates the “heater-wire mode of control.” RMD1006 at 3.5.1; FIG. 3.4 (below). “In the heater-wire mode of operation, cold ambient temperatures will cause the humidifier to automatically increase the heater-wire power, minimizing the condensate in the breathing circuit. Conversely for high ambient temperatures the heater-wire power is automatically reduced.” *Id.*

’345 Patent Claims	Exemplary Disclosure of the *MR810 Manual*
	 **Figure 3.4: Heater-wire power over the ambient temperature 10 to 40 °C** **F&P MR810 Manual, FIG. 3.4**
[2.1] An apparatus as claimed in claim 1,	*See, e.g.*, Ground 1, [1.1]-[1.9], *supra*.
[2.2] wherein said identification element is located at a patient end of said conduit.	The *MR810 Manual* discloses an identification element located at a patient end of the conduit. As discussed above, the *MR810 Manual* describes an identification element provided by the heated wire circuit. Ground 1, [1.5], *supra*. The heater wire circuit is shown to extend along the length of the breathing tube such that at least a portion of the heater wire is located at a patient end of said conduit. *See, e.g.*, RMD1001 at FIG. 3.1 (annotated below); RMD1003 at ¶ 40.  **Figure 3.1: Typical setup for oxygen therapy using a heated breathing circuit**

'345 Patent Claims	Exemplary Disclosure of the *MR810 Manual*
[4.1] An apparatus as claimed in claim 1,	*See, e.g.*, Ground 1, [1.1]-[1.9], *supra*.
[4.2] wherein said identification element is a fixed resistor.	The *MR810 Manual* discloses an identification element that is a fixed resistor provided by the heated wire. *See, e.g.*, RMD1006 at 3.4.4; 3.5.1; *see also* VII.A., *supra*; RMD1003 at ¶ 41.
'345 Patent Claims	**Exemplary Disclosure of the *MR810 Manual***
[5.1] An apparatus as claimed in claim 1, wherein	*See, e.g.*, Ground 1, [1.1]-[1.9], *supra*.
[5.2] said controller is configured to measure said characteristic impedance and identify said conduit, upon initial connection of said conduit to said apparatus.	The *MR810 Manual* discloses the controller is configured to measure said characteristic impedance, and identify said conduit, upon initial connection of the conduit to the apparatus. The *MR810 Manual* teaches that "connecting" a heated wire circuit "between 10 and 28 Ω" to the MR810 will "automatically initiate" the heater-wire mode of control, indicating that the controller measures the characteristic impedance and identifies the conduit upon "connecting" the conduit to the humidifier system. *See* RMD1006 at 3.5.1; RMD1003 at ¶ 46.
'345 Patent Claims	**Exemplary Disclosure of the *MR810 Manual***
[6.1] An apparatus as claimed in claim 1,	*See, e.g.*, Ground 1, [1.1]-[1.9], supra.
[6.2] wherein said controller is configured	The *MR810 Manual* discloses a controller configured to measure said characteristic impedance and compare it with a plurality of predetermined impedance ranges at ambient

’345 Patent Claims	Exemplary Disclosure of the *MR810 Manual*
to measure said characteristic impedance and compare it with a plurality of predetermined impedance ranges at ambient temperature in order to identify said conduit type.	temperature in order to identify said conduit type. The *MR810 Manual* describes multiple predetermined impedance ranges, including a first predetermined impedance range of “between 10 and 28 Ω,” a second predetermined range of less than 10 Ω, and a third predetermined range of greater than 28 Ω. *See* RMD1006 at 3.5.1; RMD1003 at ¶ 47. If the measured impedance is within the first predetermined impedance range, a heated breathing circuit is detected. If the measured impedance is within the second or third predetermined ranges, an unheated breathing circuit is detected. Further, the *MR810 Manual* describes that “connecting” a heated wire breathing circuit will “automatically initiate the heater-wire mode,” indicating that the controller measures the characteristic impedance upon initial connection while the heated wire breathing circuit is still at ambient temperature. *Id*.
’345 Patent Claims	**Exemplary Disclosure of the *MR810 Manual***
[7.1] An apparatus as claimed in claim 5,	*See, e.g.*, Ground 1, [1.1]-[1.9]; [5.1]-[5.2], *supra*.
[7.2] wherein said controller is configured to measure said characteristic impedance and compare it with a plurality of predetermined impedance ranges at ambient temperature in order to	*See, e.g.*, Ground 1, [6.2], *supra*.

’345 Patent Claims	Exemplary Disclosure of the *MR810 Manual*
identify said conduit type.	
345 Patent Claims	**Exemplary Disclosure of the *MR810 Manual***
[8.1] A method of identifying a conduit attached to an apparatus comprising	The *MR810 Manual* describes a controller that measures an impedance of the heated breathing wire circuit and identifies the conduit as either a heated breathing circuit or an unheated breathing circuit. *See, e.g.*, RMD1006 at 3.5.1 (“Connecting a heated wire breathing circuit (between 10 and 28 Ω) to the MR810 will automatically initiate the heater-wire mode of control.”); *see also* Ground 1, [1.7]-[1.8], *supra*.
[8.2] attaching a conduit comprising a heater wire including an identification element to said apparatus,	The *MR810 Manual* describes attaching a conduit comprising a heater wire including an identification element. *See* RMD1006 at FIG. 3.2; 3.5.1 (“Connecting a heated wire breathing circuit . . .”); RMD1003 at ¶¶ 39-44. The “heated wire circuit” provides an identification element that includes a characteristic impedance and that is used to identify a type of breathing tube connected to the system based on its characteristic impedance “between 10 and 28 Ω.” RMD1006 at 3.4.4; 3.5.1.
[8.3] measuring a characteristic impedance of said identification element,	The *MR810 Manual* describes “[c]onnecting a heated wire breathing circuit (between 10 and 28 Ω) to the MR810 will automatically initiate the heater-wire mode of control,” indicating that the controller measures the impedance to determine if the impedance is between 10 and 28 Ω. RMD1006 at 3.5.1; RMD1003 at ¶¶ 39-41.
[8.4] comparing said measured characteristic impedance with a predetermined	The *MR810 Manual* discloses comparing the measured characteristic impedance of the heated wire breathing circuit with a predetermined impedance value. The *MR810 Manual* teaches that “[c]onnecting a heated wire breathing circuit (between 10 and 28 Ω) to the MR810 will automatically initiate the heater-wire mode of control,” indicating that the system initiates “heater-wire mode of control” if the measured

impedance value,	impedance is "between 10 and 28 Ω" and initiates "non heater-wire mode of control" if the measure impedance is less than 10 Ω or greater than 28 Ω. *See* RMD1006 at 3.5.1; *see also* Ground 1, [1.8], [6.2], *supra*.
[8.5] applying power to said heater wire based on said comparison.	The *MR810 Manual* discloses applying power to the heater wire based on the comparison of the measured characteristic impedance with a predetermined impedance value. If a heated breathing circuit is detected based on a characteristic impedance having a predetermined value "between 10 and 28 Ω," then "the MR810 will automatically initiate the heater-wire mode of control" to apply power to the heater wire, and if an unheated breathing circuit is present based on an impedance having a predetermined value up to 10 Ω or greater than 28 Ω, then the MR810 will not apply heater wire power. RMD1006 at 3.5.1; *see also* Ground 1, [1.9], *supra*; RMD1003 at ¶¶ 41, 45. In the heater wire mode of control, power is applied to the heater wire. *See* RMD1006 at FIG. 3.4.
'345 Patent Claims	**Exemplary Disclosure of the *MR810 Manual***
[9.1] An apparatus as claimed in claim 8, wherein	*See, e.g.*, Ground 1, [8.1]-[8.5], *supra*.
[9.2] said step of measuring said characteristic impedance and said step of identifying said conduit, is carried out upon initial connection of	*See, e.g.*, Ground 1, [5.2], *supra*.

said conduit to said apparatus.	
'345 Patent Claims	**Exemplary Disclosure of the *MR810 Manual***
[10.1] An apparatus as claimed in claim 8,	*See, e.g.*, Ground 1, [8.1]-[8.5], *supra*.
[10.2] wherein said characteristic impedance is compared with a plurality of predetermined impedance ranges, and	*See, e.g.,* Ground 1, [6.2], *supra.*
[10.3] said step of applying power is based on the predetermined range that said measured characteristic impedance is in.	*See, e.g.,* Ground 1, [10.3], *supra.*
'345 Patent Claims	**Exemplary Disclosure of the *MR810 Manual***
[11.1] An apparatus as	*See, e.g.*, Ground 1, [9.1]-[9.2], *supra*.

claimed in claim 9,	
[11.2] wherein said characteristic impedance is compared with a plurality of predetermined impedance ranges,	*See, e.g.*, Ground 1, [10.2], *supra*.
[11.3] and said step of applying power is based on the predetermined range that said measured characteristic impedance is in.	*See, e.g.*, Ground 1, [10.3], *supra*.

B. GROUND 2 – Claims 1-3 and 5-11 are unpatentable under 35 U.S.C. § 103 over the *MR810 Manual* in view of *Gradon*, *Edirisuriya,* and *Figley.*

1. Overview of the *Gradon* reference

Gradon describes an air delivery system for respiratory humidification with measurement sensors, including temperature and flow sensors provided by thermistors, associated with a breathing tube. RMD1005 at 7:50-53. *Gradon* recognized the importance of accurate temperature measurements to allow "heat

source control[] in response to changes in that temperature," and indicates that a system having "all or some of" its features enables humidity and/or temperature control of the humidified gases. *See id.* at 1:14-24; 18:54-19:11. To achieve these advantages, *Gradon* teaches a "controller 11" of its humidification system can "sense outlet gases temperature and flow rate," based in part on a "temperature sensing means" positioned at the patient end of the breathing tube, "and adjust . . . heater wire setting[s] to automatically provide optimal (or as near to optimal as possible) gases temperature and humidity to patient 13." *See, e.g.*, *id.* at 14:55-64. The "temperature sensing means or temperature probe 17 may be provided at or near the patient to indicate the gases temperature being received by the patient," and are "preferably thermistors." *Id.* at 8:19-42; Abstract. *Gradon's* system includes "control means 11" that "controls the operation of the humidification system in accordance with instructions set in the software and also in response to external inputs" received from the temperature and flow sensors, for example. *Id.*

The basic components of *Gradon's* overall system are essentially the same as that of the '345 patent and the *MR810 Manual*. RMD1003 at ¶¶ 48-50. As shown in annotated FIG. 5 below, *Gradon's* humidification system includes a "blower 1" that forces air through the system, a "humidifier 10" that adds water vapor to the air, a heated "conduit 14" that conveys the humidified air, a "temperature sensor 17" to measure the air temperature at the patient end of

"conduit 14", and a "mask 16" that delivers the humidified air to the patient 13. *Id.* at 7:53-8:14; 8:28-35.

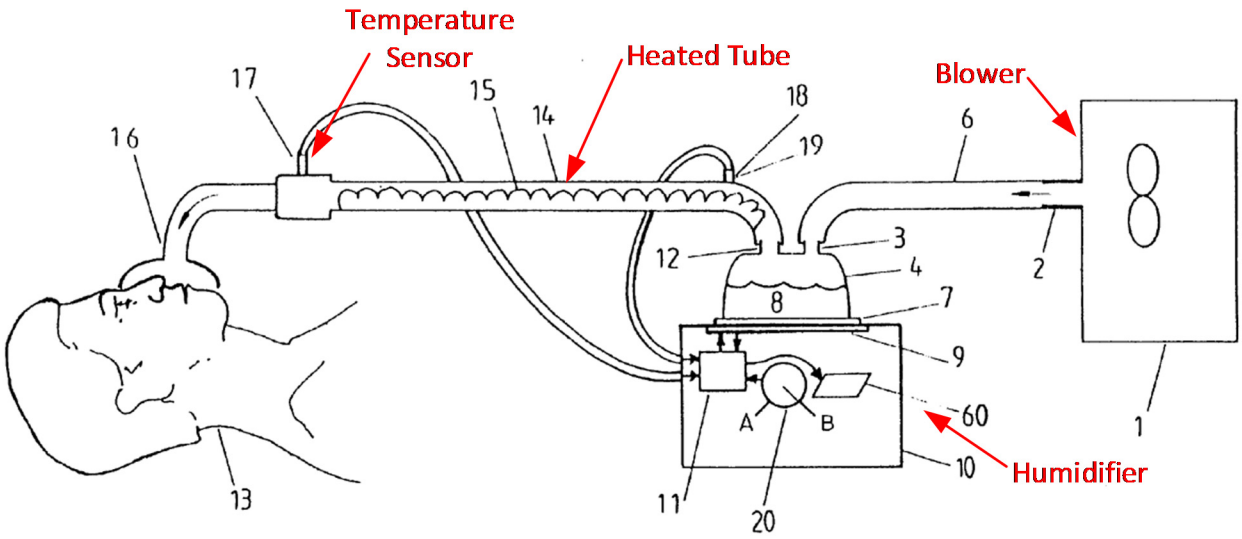


FIG. 5

2. *Gradon* discloses an electrical circuit including a temperature sensor having a characteristic impedance located near the patient end of a breathing tube.

The *MR810 Manual* discloses all or nearly all of the features recited in the challenged claims. However, to the extent claim 1 is narrowly interpreted (e.g., if the *MR810 Manual* were considered to not expressly disclose an electrical circuit including a heater wire and an identification element having a characteristic impedance, as set forth in Ground 1), Petitioners submit it was conventional in the art to use thermistors as measurement sensors along a heated breathing conduit, and thermistors were known to have a characteristic impedance. For example, *Gradon* describes temperature sensors that "may be provided at or near the patient

to indicate the gases temperature being received by the patient," and that the temperature sensors are "preferably thermistors." RMD1005 at Abstract; 8:19-42.

3. Overview of the *Edirisuriya* reference

Edirisuriya describes another air delivery system for respiratory humidification, and discloses use of a heater wire itself to transmit signals between measurement sensors positioned on the breathing conduit and a controller. *See, e.g.*, RMD1004 at ¶¶ [0004]-[0009]; ¶¶ [0047]-[0049]. *Edirisuriya* recognized the disadvantages of "external wires that may cause problems for the user and will be in the way when in use." *Id*. at ¶ [0003]. To address these problems, *Edirisuriya* describes a breathing tube connection that provides both pneumatic coupling and electrical coupling for electrical wire extending along the tube, and teaches use of the heater wire itself to transmit signals from measuring sensors associated with the breathing tube (e.g. instead of including an additional or external wire extending between the sensors and the system controller). *See Id.* at ¶ [0070]. Further, *Edirisuriya* teaches that additional components related to the heated wire circuit can be included in the connecting ends of its breathing tube. For example, "a small indicator, such as an LED, is embedded in either the male or female portion of the connector to allow for visual confirmation of an active circuit, so as to indicate both an electrical connection and a pneumatic seal." RMD1004 at ¶ [0069].

The basic components of *Edirisuriya's* overall system are essentially the same as that of the '345 patent, the *MR810 Manual* and *Gradon*. RMD1003 at ¶¶ 52-53. Like *Gradon*, *Edirisuriya* teaches measuring sensors may be positioned at ends of the breathing tube, but *Edirisuriya* indicates the heater wire itself, rather than an external wire, can be used to transmit sensor signals between the sensor and the controller. As shown in annotated FIG. 2 below, *Edirisuriya's* humidification system includes a gases supply provided by a "blower" that forces air through the system, a "humidifier" that adds water vapor to the air, a delivery conduit provided by heated "conduit 101" having an internal "heating wire means 15" that conveys the humidified air, and a "mask" that delivers the humidified air to the patient. *Id*. at ¶¶ [0048]-[0050].

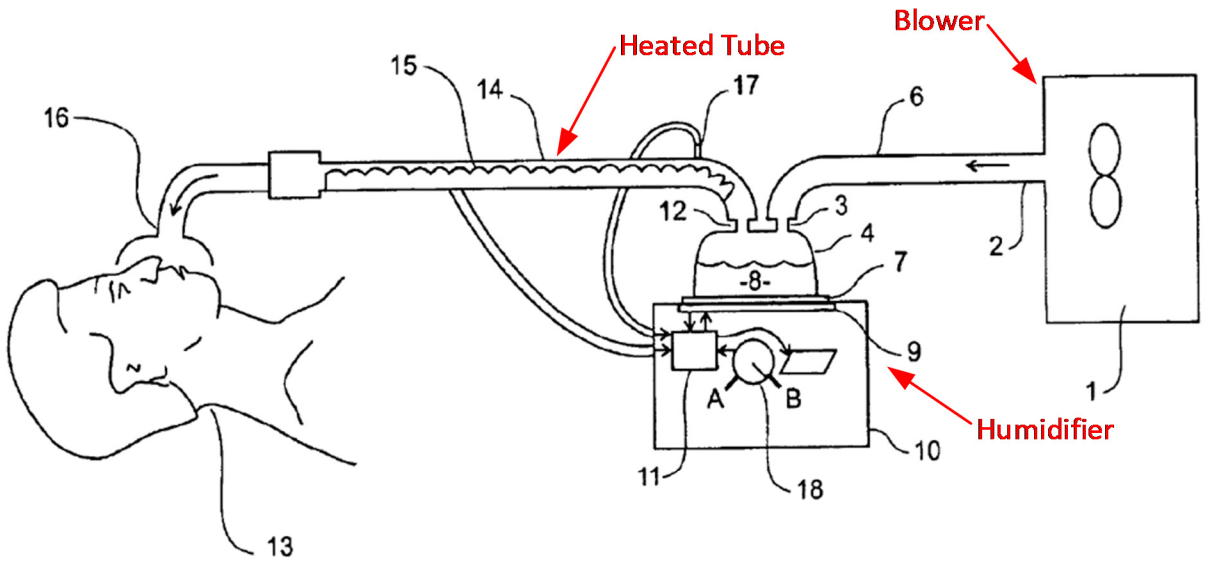


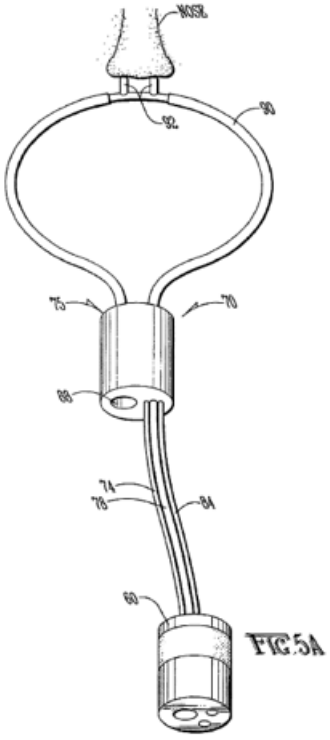
FIGURE 2

4. *Edirisuriya* discloses a heater wire utilized in an electrical circuit including at least one identification element, and an electrical connection to the identification element, as part of a breathing tube.

The *MR810 Manual* in view of *Gradon* discloses all or nearly all of the features recited in the challenged claims. However, to the extent claim 1 is narrowly interpreted (e.g., if the *MR810 Manual* in view of *Gradon* were considered to not expressly disclose a heater wire utilized in an electrical circuit including at least one identification element having a characteristic impedance), Petitioners submit that such a feature was common in the art. *See, e.g,* RMD1003 at ¶¶ 51, 53. As discussed above, *Edirisuriya* describes a conduit having a "heater wire" with "measuring sensors placed at the end or at intermediate positions along the conduit," and that "the heater wire itself could be used to carry electrical signals from measuring sensors." RMD1004 at ¶ [0070]. That is, *Edirisuriya* teaches its measuring sensors are connected to, and utilized in an electrical circuit with, the heater wire such that measurement signals are transmitted between the sensor and the controller via the heater wire. Further, *Edirisuriya* describes a single connector providing both a pneumatic connection and an electrical connection to connect the heater wire and measuring sensors to the controller. *See Id.* at ¶¶ [0002]-[0003], [0005], [0070].

5. Overview of the Figley reference

Figley describes a respiratory system that supplies breathing gases to a patient. RMD1029 at Abstract. The system includes a resistor identification element to identify a component type. In one example, the system includes a "controlled source of therapeutic gas," a patient interface, such as "nasal prongs 92," a "lumen 90" through which gas travels to patient interface, and a number of intermediary components between the source of therapeutic gas and the patient interface. *See, e.g.,* RMD1029 at 17:11-50; FIG. 5A. *Figley* describes its system includes a "cannula connector 60" having a "means MC to indicate the type and characteristics of the device" that could be provided by a "resistor." RMD1029 at 16:25-35.



Figley, FIG. 5A

6. A POSITA would have combined the *MR810 Manual* and *Gradon.*

A POSITA, at the time of filing the application leading to the '345 patent, would have combined the temperature sensor (e.g. thermistor) of *Gradon* with the system of the *MR810 Manual*, because such a combination amounts to an obvious combination of prior art elements according to known methods to yield predictable results. *See KSR v. Teleflex*, 550 U.S. 398, 416 (2007); MPEP § 2143 I(A).

Including *Gradon's* thermistor temperature sensor, for example, with the system described by the *MR810 Manual*, would facilitate monitoring of the temperature of gases flowing through the breathing conduit to provide precise control of the humidification system and/or heating wire to achieve target gas characteristics. *See* RMD1003 at ¶¶ 51, 54. Such an arrangement was commonplace in humidification systems having heated breathing conduits at the time of the '345 patent. *See, e.g. id.*; *see also* V.B., *supra*. For example, a POSITA would have incorporated *Gradon's* thermistor temperature sensor near the patient end of the heated breathing circuit of the *MR810 Manual* to more precisely control temperature and gas delivery by using temperature measurements of gases near the patient to control the humidifier temperature and/or heater wire temperature. *See, e.g.*, RMD1005 at 8:19-42; RMD1003 at ¶ 55. Indeed, *Gradon* teaches the temperature detected by its thermistor temperature sensor could be used

by "controller 11" to "adjust heater plate power and possibly heater wire setting[s] to automatically provide optimal (or as near to optimal as possible) gases temperature and humidity to patient 13, independent of changes in flow rate or inlet gases temperature." *See, e.g., id.*; RMD1005 at 14:55-64. Accordingly, a combination of a thermistor temperature sensor, as taught by *Gradon*, with the system of the *MR810 Manual*, would provide more precise control of the gases temperature delivered to the patient by facilitating control of the heater wire based on the measured temperature, instead of controlling the heater wire based on the ambient temperature alone. *Id.*

As an alternative, a POSITA would have modified the system of the *MR810 Manual* in a second manner by incorporating the entire "temperature probe 17" of *Gradon*, including a temperature sensor and a flow sensor. RMD1003 at ¶ 56. Such a combination would facilitate more precise flow control and air delivery to the patient by providing a feedback for control of the heater plate and/or heater wire, as well as the gas source, of the *MR810 Manual*. *See, e.g.,* RMD1005 at 14:55-64.

Furthermore, one of skill in the art would have been prompted to modify the system of the *MR810 Manual* with the temperature and/or flow rate sensors of *Gradon* because *Gradon* expressly teaches advantages associated with such measuring sensors. RMD1005 at 14:55-64; *see* MPEP § 2143 I(D) (citing *DyStar*

Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co., 464 F.3d 1356, 1360 (Fed. Cir. 2006)). *Gradon* teaches that the sensors are "preferably thermistors," and that "the controller 11 would repeatedly sense outlet gases temperature and flow rate and adjust heater plate power and possibly heater wire setting to automatically provide optimal (or as near to optimal as possible) gases temperature and humidity to patient 13, independent of changes in flow rate or inlet gases temperature." RMD1005 at 14:55-64. One of skill would have a reasonable expectation of success in using a measuring sensor having a thermistor, for example, and such a modification would result in improved accuracy and reliability in monitoring properties of gases flowing through the breathing tube as noted above. RMD1003 at ¶¶ 54-56.

7. A POSITA would have combined the *MR810 Manual* and *Gradon* with *Edirisuriya.*

A POSITA, at the time of filing the application leading to the '345 patent would have combined the *MR810 Manual* and *Gradon* with *Edirisuriya* to include a thermistor temperature sensor in the circuit with the heater wire, because such a modification amounts to a simple substitution of one known element for another to obtain predictable results. *See KSR v. Teleflex*, 550 U.S. 398, 416 (2007); MPEP § 2143 I(B).

Modifying the system of the *MR810 Manual* and *Gradon* with *Edirisuriya*

so that the "heater wire itself" carries electrical signals between the measuring sensors and the controller would simplify construction of the heated wire conduit by reducing the number of wires and connections required. *See* RMD1003 at ¶57. Instead of separate wires and/or electrical connections for both the heater wire and sensor transmission wire, a single connection could be used. Further, such a configuration would eliminate an external wire to transmit measuring signals between the sensor and the controller, and instead transmit the measuring signals along the heater wire protected within the breathing tube. Use of the heater wire itself, instead of an additional wire, would thus reduce the number of components, and associated complexity and cost of the breathing tube, while improving reliability. *See id.*

Additional features of the heater-wire adapter, such as the LED indicator and ambient temperature sensor, would have been readily combined with the breathing tube connector by a POSITA. RMD1003 at ¶ 58. Indeed, *Edirisuriya* teaches that additional components can be included in its connection and expressly describes an LED indicator "embedded" in the male or female portion of the connector. RMD1004 at ¶ [0069]. Given the express teachings of *Edirisuriya* regarding the structure of a combined electrical and pneumatic connector, and the similarities in connection between the humidifiers of the *MR810 Manual* and *Edirisuriya*, any further adjustments could be readily anticipated by a POSITA to prevent fluid

leakage and to provide a consistent electrical contact. *See, e.g. id.*; RMD1004 at ¶ [0070]; RMD1003 at ¶ 58.

Additionally, a POSITA would have been prompted to modify the system described by the *MR810 Manual* and *Gradon* to use the heater wire as a transmission line for measurement signals as described by *Edirisuriya* because *Edirisuriya* expressly teaches advantages of its configuration. *See, e.g.*, RMD1004 at ¶ [0003]; *see* MPEP § 2143 I(D) (citing *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.,* 464 F.3d 1356, 1360 (Fed. Cir. 2006)). For example, just like the '345 patent, *Edirisuriya* recognized the disadvantage of "external wires that may cause problems for the user and will be in the way when in use," suggesting the benefits associated with reducing the number of wires required by the system. *See, e.g.,* RMD1004 at ¶¶ [0003], [0070]. Indeed, these problems expressly addressed by *Edirisuriya* were described by the '345 Patent. *See* RMD1001 at 1:34-43. A POSITA would have been prompted to modify the system of the *MR810 Manual* in view of *Gradon* to transmit measuring signals through the heater wire as taught by *Edirisuriya* in order to address the stated disadvantages associated with "external wires." RMD1003 at ¶ 59. One of skill in the art would have had reasonable expectations of success in using the heater wire itself to transmit signals from *Gradon's* measuring sensor, for example, because *Edirisuriya* expressly teaches such a configuration, as well as a corresponding

connector that provides both pneumatic and electrical connection between the breathing tube and humidifier. *See* RMD1004 at ¶¶ [0002]-[0003], [0005], [0070]; RMD1003 at ¶ 58.

8. A POSITA would have combined the *MR810 Manual*, *Gradon* and *Edirisuriya*, with *Figley*

A POSITA, at the time of filing the application leading to the '345 patent, would have been prompted to combine *Figley's* teachings of using a resistor to identify a type of component connected to a respiratory system with the system of the *MR810 Manual* in view of *Gradon* and *Edirisuriya*, because such a combination amounts to an obvious combination of prior art elements according to known methods to yield predictable results. *See KSR v. Teleflex*, 550 U.S. 398, 416 (2007); MPEP § 2143 I(A).

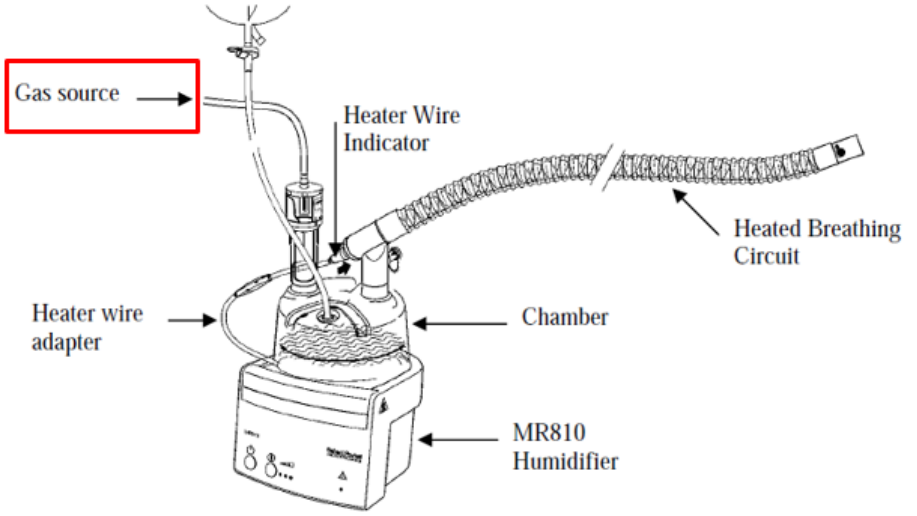
Modifying the system of the *MR810 Manual* in view of *Gradon* and *Edirisuriya*, so that the resistor (thermistor) serves as an identification element would facilitate identification of the type of breathing conduit connected to the system, as taught by *Figley*. RMD1003 at ¶ 60. Indeed, *Figley* describes using a resistor to identify a type of component connected in its respiratory system. RMD1029 at 16:25-35. A POSITA would have been prompted to apply *Figley*'s resistor-based respiratory component identification technique to the thermistor sensor in series with the heater wire in the system resulting from the combination

of the *MR810 Manual*, *Gradon*, and *Edirisuriya*, as described above, in order to identify the type of a connected breathing circuit so as to ensure proper operation of the respiratory system with the connected breathing circuit. RMD1003 at ¶ 60. One of skill in the art would have reasonable expectations of success, because *Figley* expressly teaches using a resistor to identify a connected component in a respiratory system. RMD1029 at 16:25-35.

9. The *MR810 Manual* in view of *Gradon*, *Edirisuriya,* and *Figley* discloses all the limitations of claims 1-3 and 5-11.

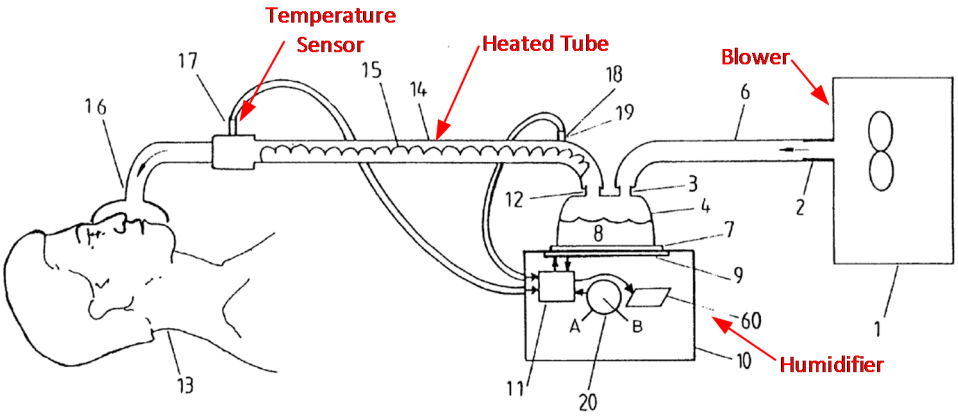
The following claim chart sets forth in detail exemplary disclosure from the *MR810 Manual*, *Gradon*, *Edirisuriya*, and *Figley* showing how the prior art references disclose each element of claims 1-3 and 5-11.

'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley***
[1.1]	The *MR810 Manual* discloses an apparatus for supplying gases to a patient. *See, e.g.,* RMD1006 at 3.1; FIG. 3.1. The *MR810 Manual* describes the "MR810 Respiratory Humidifier is designed to heat and humidify respiratory gases delivered to the patient via a face, nasal, or oral mask. The inspired gas is passed through the chamber of water where it is heated and humidified. An optional heated breathing circuit (heated via a wire inside the circuit), can be used to minimise condensate in the breathing circuit and maximize humidity delivery to the patient." *Id*.
[1.2]	The *MR810 Manual* discloses a gases supply provided by a "gas source" and the humidifier chamber from which air enters the breathing circuit. *See, e.g.*, RMD1006 at FIGS. 3.1-3.2.

’345 Patent Claims	Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley*
	 **Figure 3.1: Typical setup for oxygen therapy using a heated breathing circuit** **F&P MR810 Manual, FIG. 3.1 (annotated)**
[1.3]	The *MR810 Manual* discloses a delivery conduit including a heater wire for heating the conduit provided by a “heated breathing circuit (heated via a wire inside the circuit).” *See, e.g.*, *Id.* at 3.1.
[1.4]	The *MR810 Manual* discloses that the heater wire is located within, around or throughout the conduit. *See, e.g.*, *Id.* at 3.1; FIG. 3.1 (teaching the heated breathing circuit is “heated via a wire inside the circuit.”).
[1.5]	The *MR810 Manual*, including a thermistor measurement sensor in series with the heater wire as taught by *Gradon*, *Edirisuriya*, and *Figley* discloses a heater wire utilized in an electrical circuit including at least one identification element having a characteristic impedance. RMD1003 at ¶ 60. *Gradon* discloses a “temperature probe 17” including a thermistor coupled to the heated tube for providing temperature feedback to the “control means 11” of the humidifier 10. RMD1005 at 8:28-34, FIG. 5. The thermistor exhibits a characteristic impedance range at a given temperature such that the thermistor can be used as an identification element. *See* RMD1003 at ¶¶ 60-61. *Edirisuriya* teaches that “the heater wire itself could be used to carry electrical signals from measuring sensors,” indicating the heater wire is utilized in an electrical circuit with the identification element, provided by the thermistor, having a

'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley***
	characteristic impedance. RMD1004 at ¶ [0070]. *Figley* describes a "cannula connector 60" having a "resistor" to "indicate the type and characteristics of the device." RMD1029 at 16:25-35.
[1.6]	The *MR810 Manual* discloses a controller for controlling the heating of the heater wire. The *MR810 Manual* describes the "humidifier applies power to the heater-wire circuit dependent on the ambient temperature and the mode selected," and describes operation of a "heater-wire mode of control," indicating the humidifier includes a controller for controlling the heating of the heater wire. *See, e.g.*, RMD1006 at 3.5.1.
[1.7]	The *MR810 Manual,* including a thermistor measurement sensor in series with the heater wire as taught by *Gradon, Edirisuriya*, and *Figley*, discloses wherein the controller is adapted to measure the characteristic impedance of the identification element. RMD1003 at ¶ 61. The *MR810 Manual* describes that its controller identifies the type of breathing circuit that is connected based on measuring the impedance of the heated wire circuit, and also determines whether to initiate the heater-wire mode of control based on the measured impedance. *See, e.g.*, RMD1006 FIG. 3.2; 3.5.1. Furthermore, the resulting combination of *Gradon*'s thermistor, which a POSITA would have readily understood to have a characteristic impedance (*see, supra*, VIII.D.2), with the *MR810 Manual*'s heater wire and controller provides measurement of the characteristic impedance of the identification element connected with the heater wire. RMD1003 at ¶ 61. The system described by the *MR810 Manual* then identifies the type of breathing circuit that is connected, and whether to initiate the "heater-wire mode of control," by comparing the measured impedance to predetermined ranges (e.g. "between 10 and 28 Ω"). *See, e.g.,* id.; RMD1006 at 3.5.1; Ground 1, [1.7], *supra*..
[1.8]	The *MR810 Manual* in view of *Gradon*, *Edirisuriya*, and *Figley* discloses a humidifier controller configured to identify a delivery conduit based on the characteristic impedance of the identification element. *See* RMD1006 at 3.5.1; RMD1003 at ¶ 61. The MR810 device identifies a conduit as either a "heated

'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley***
	breathing circuit" or an "unheated breathing circuit" by comparing the measured characteristic impedance to predetermined ranges: "Connecting a heated wire breathing circuit (between 10 and 28 Ω) to the MR810 will automatically initiate the heater-wire mode of control." RMD1006 at FIG. 3.2; 3.5.1; *see also* Ground 1, [1.6]-[1.7], *supra*. *Figley* describes a "cannula connector 60" having a "resistor" to "indicate the type and characteristics of the device." RMD1029 at 16:25-35.
[1.9]	The *MR810 Manual* discloses applying power to a heater wire based at least in part on the identified conduit. *See* RMD1006 at 3.5.1; FIG. 3.4; Ground 1, [1.6]-[1.7], *supra*; RMD1003 at ¶ 61. FIG. 3.4 of the *F&R MR810 Manual* illustrates an example of the applied "heater wire power" when the conduit is identified as a "heated breathing circuit" and the system initiates the "heater-wire mode of control." RMD1006 at 3.5.1.
[2.1]	*See, e.g.*, Ground 2, [1.1]-[1.9], *supra*.
[2.2]	The *MR810 Manual*, including a thermistor measurement sensor in series with the heater wire as taught by *Gradon* in view of *Edirisuriya*, discloses an identification element located at a patient end of the conduit. RMD1003 at ¶ 57. As discussed above, *Gradon* teaches its "temperature probe 17 may be provided at or near the patient to indicate the gases temperature being received by the patient"). RMD1005 at FIG. 5 (below); 8:28-34. *Edirisuriya* describes "measuring sensors placed at the end" of the breathing conduit. *See, e.g.*, RMD1004 at ¶ [0070].

’345 Patent Claims	Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley*
	 FIG. 5

’345 Patent Claims	Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley*
[3.1] An apparatus as claimed in claim 1,	*See, e.g.*, Ground 2, [1.1]-[1.9], *supra*.
[3.2] wherein said characteristic impedance is a thermistor resistance range.	As discussed above, *Gradon* discloses an identification element provided by a thermistor. *See, e.g.*, Ground 2, [1.5], *supra*. A thermistor provides a characteristic impedance range such that the sensor can be used as an identification element. *See* RMD1003 at ¶ 60.

’345 Patent Claims	Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley*
[5.1]	*See, e.g.*, Ground 2, [1.1]-[1.9], *supra*.
[5.2]	The *MR810 Manual* discloses the controller is configured to measure the characteristic impedance and identify the conduit, upon initial connection of the conduit to the apparatus. For example, the *MR810 Manual* teaches that “connecting” a heated wire circuit “between 10 and 28 Ω” to the MR810 will “automatically initiate” the heater-wire mode of control, indicating that the controller measures the characteristic impedance and identifies the conduit as a heated or unheated breathing circuit upon “connecting” the conduit to the

'345 Patent Claims	Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley*
	humidifier system. *See* RMD1006 at 3.5.1; Ground 1, [5.2] *supra*.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley***
[6.1]	*See, e.g.*, Ground 2, [1.1]-[1.9], supra.
[6.2]	The *MR810 Manual* discloses a controller configured to measure the characteristic impedance and compare it with a plurality of predetermined impedance ranges at ambient temperature in order to identify the conduit type. RMD1003 at ¶ 47. The *MR810 Manual* describes multiple predetermined impedance ranges, including a first predetermined impedance range of "between 10 and 28 Ω," a second predetermined range of less than 10 Ω, and a third predetermined range of greater than 28 Ω. *See, e.g.*, RMD1006 at 3.5. If the measured impedance is within the first predetermined impedance range, a heated breathing circuit is detected and if the measured impedance is within the second or third predetermined ranges, an unheated breathing circuit is detected. Further, the *MR810 Manual* describes that "connecting" a heated wire breathing circuit will "automatically initiate the heater-wire mode," indicating that the controller measures the characteristic impedance upon initial connection while the heated wire breathing circuit is still at ambient temperature. *See Id.* at 3.5.1.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley***
[7.1]	*See, e.g.*, Ground 2, [1.1]-[1.9]; [5.1]-[5.2], *supra*.
[7.2]	*See, e.g.*, Ground 2, [6.2], *supra*.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley***
[8.1]	The *MR810 Manual* discloses identifying a conduit attached to an apparatus. As described above, the *MR810 Manual* teaches a controller that measures an impedance of the heated breathing wire circuit and identifies the conduit as either a heated breathing circuit or an unheated breathing circuit. *See, e.g.*, Ground 1, [1.7]-[1.8], *supra*; RMD1006 at 3.5.1. *Figley* describes a "cannula connector 60" having a "resistor" to

'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley***
	"indicate the type and characteristics of the device." RMD1029 at 16:25-35.
[8.2]	The *MR810 Manual* including a thermistor measurement sensor in series with the heater wire as taught by *Gradon, Edirisuriya,* and *Figley,* discloses attaching a conduit comprising a heater wire including an identification element to the apparatus. . The *MR810 Manual* describes attaching a conduit comprising a heater wire. *See, e.g.*, RMD1006 at FIG. 3.2; 3.5.1. *Gradon* discloses a "temperature probe 17" including a thermistor coupled to the heated tube for providing temperature feedback to the "control means 11" of the humidifier 10. RMD1005 at 8:28-34; FIG. 5. The thermistor provides a characteristic impedance range at a given temperature such that the sensor can be used as an identification element. *See* RMD1003 at ¶ 60. *Edirisuriya* teaches that "the heater wire itself could be used to carry electrical signals from the measuring sensors," indicating the electrical circuit includes the heater wire and the identification element, provided by the thermistor, having a characteristic impedance. RMD1004 at ¶ [0070]. *Figley* describes a "cannula connector 60" having a "resistor" to "indicate the type and characteristics of the device." RMD1029 at 16:25-35.
[8.3]	*See, e.g.* Ground 2, [1.7], *supra*.
[8.4]	The *MR810 Manual* including a thermistor measurement sensor in series with the heater wire as taught by *Gradon* and *Edirisuriya* discloses comparing said measured characteristic impedance with a predetermined impedance value. RMD1003 at ¶¶ 60-61. The *MR810 Manual* describes that its device identifies which type of breathing circuit is connected, and whether to initiate the heater-wire mode of control, by comparing the measured characteristic impedance to the predetermined range of "10 and 28 Ω." *See, e.g.*, RMD1004 at FIG. 3.2; 3.5.1; *see also,* Ground 1, [1.7].
[8.5]	The *MR810 Manual* discloses applying power to the heater wire based on the comparison of the measured characteristic

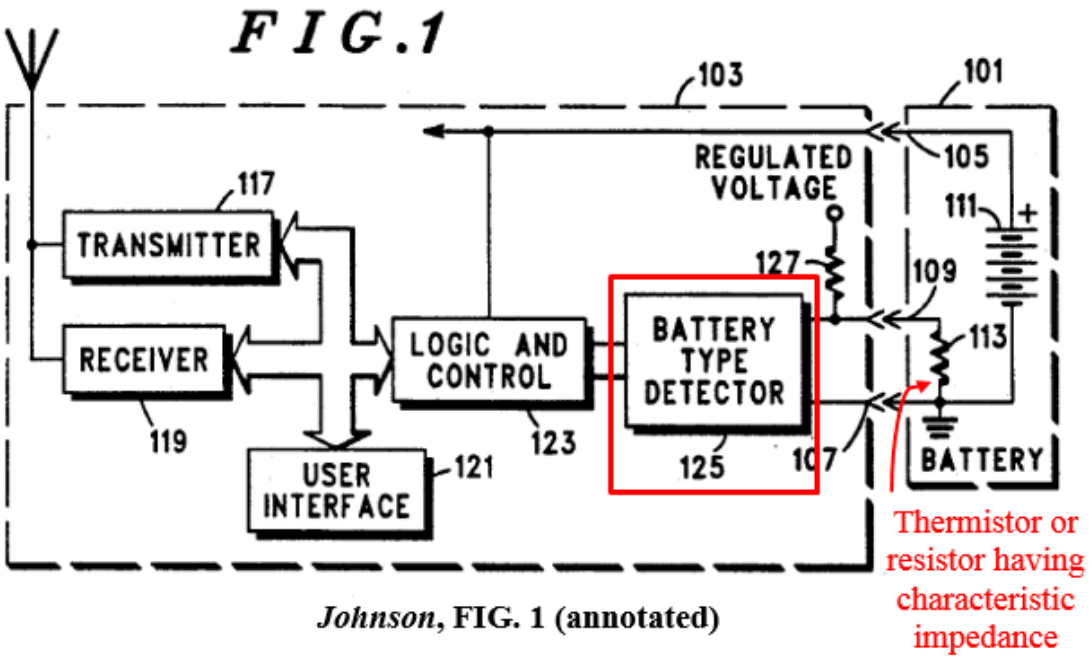
'345 Patent Claims	Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley*
	impedance with a predetermined impedance value. RMD1003 at ¶ 61. If a heated breathing circuit is detected based on a characteristic impedance having a predetermined value "between 10 and 28 Ω," then "the MR810 will automatically initiate the heater-wire mode of control" to apply power to the heater wire, and if an unheated breathing circuit is present based on an impedance having a predetermined value up to 10 Ω or greater than 28 Ω, then the MR810 will not apply heater wire power. RMD1006 at 3.5.1; *see also* Ground 1, [1.9], *supra*.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley***
[9.1]	*See, e.g.*, Ground 2, [8.1]-[8.5], *supra*.
[9.2]	*See, e.g.*, Ground 2, [5.1]-[5.2], *supra*.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley***
[10.1]	*See, e.g.*, Ground 2, [8.1]-[8.5], *supra*.
[10.2]	*See, e.g.,* Ground 2, [6.2], *supra.*
[10.3]	The *MR810 Manual* discloses applying power based on the predetermined range that said measured characteristic impedance is in. RMD1003 at ¶ 61. The *MR810 Manual* describes that its controller measures an impedance and identifies the presence of a heated breathing circuit if the measured impedance is within a first predetermined impedance range of "between 10 and 28 Ω," indicating that the *MR810 Manual* describes identifying if the measured impedance is within the first predetermined range between 10 and 28 Ω, a second predetermined range between 0 to 10 Ω, and a third predetermined range of greater than 28 Ω. RMD1006 at 3.5.1. The *MR810 Manual* describes that the controller applies power based on the range the characteristic impedance is in by "initiat[ing] the heater-wire mode" based on a characteristic impedance within the first predetermined range "between 10 and 28 Ω," and not applying heating wire power if the characteristic impedance is in a different range. *See, e.g.*, *id.*; *see also* Ground 1, [6.2], [8.5], *supra*.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley***

’345 Patent Claims	Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Figley*
[11.1]	*See, e.g.*, Ground 2, [9.1]-[9.2], *supra*.
[11.2]	*See, e.g.*, Ground 2, [10.2], *supra*.
[11.3]	*See, e.g.*, Ground 2, [10.3], *supra*.

C. GROUND 3 – Claims 1-11 are unpatentable under 35 U.S.C. § 103 over the *MR810 Manual* in view of *Gradon*, *Edirisuriya,* and *Johnson.*

1. Overview of the *Johnson* reference

Johnson generally describes the use of an identification element having a characteristic impedance to provide the identity of which of a plurality of components has been connected to a device. *See, e.g.,* RMD1007 at FIGS. 1, 6A-9; 1:7-18; 2:64-3:48. For example, *Johnson* describes using a thermistor or a resistor to indicate a particular battery type installed in a communication or charging device: “A sensing electrical component 113 (such as a resistor, thermistor . . . or other elements which may provide auxiliary sensing capability) is utilized in the present invention to provide an electrical signature indication of battery type.” *Id.* at 2:64-68. A “battery type detector 125” measures an input signal related to the electrical signature of the resistor or thermistor so that the device can be operated in accordance with the particular battery type that is installed. *See id.* at 3:19-39; RMD1003 at ¶ 63. FIG. 1 of *Johnson*, annotated below, shows the “sensing electrical component 113,” (e.g. thermistor or resistor) and “battery type detector 125” that measures the impedance of “sensing electrical component 113.”



Johnson, FIG. 1 (annotated)

In one example, a resistor or thermistor is provided that has "a different value of resistance for each battery type," such that "the sense input voltage" detected by the "battery type detector" is "a different value for each battery type." *See id.* at 3:19-37; RMD1003 at ¶ 64. "Based upon the value of the sense input as measured by detector 125, the radio transceiver 103 determines which battery type is connected and adjust its operating parameters accordingly." *Id.* at 3:35-38. Johnson provides multiple ranges of thermistor and resistor resistance ranges that can be used to identify a particular battery type. *See id.* at Table 1.

TABLE 1

Battery Type	Component 113 Value (Ohms)
0 (manual test)	0–1K
1 (NiCd)	1K–2K*
2	2K–3K
3	3K–5K
4	5K–10K
N (default)	>10K

*thermistor

Thermistor resistance range

Fixed resistor resistance ranges

***Johnson*, Table 1 (annotated)**

2. A POSITA would have combined the *MR810 Manual Edirisuriya, Gradon*, and *Johnson*

A POSITA at the time of the '345 patent would have combined the "sensing electrical component 113" of *Johnson* with the system of the *MR810 Manual* in view of *Gradon* and *Edirisuriya*, as set forth in Ground 2, because such a combination amounts to an obvious combination of prior art elements according to known methods to yield predictable results. *See KSR v. Teleflex*, 550 U.S. 398, 416 (2007); MPEP § 2143 I(A).

Combining a "sensing electrical component 113" (e.g. provided by the thermistor sensor or an additional thermistor or fixed resistor in series with the heater wire), as taught by *Johnson,* that would be measured by the controller of the *MR810 Manual* system, would improve identification of a connected breathing tube. RMD1003 at ¶ 65. For example, such a combination would facilitate identification of additional types of breathing tubes usable with the MR810 system, because multiple thermistors or fixed resistors having distinct values within

different resistance ranges could be associated with different heated and/or unheated breathing tube types. Indeed, in one example, *Johnson* teaches six resistance ranges of the thermistor or fixed resistor to indicate the presence or absence of a component. *See, e.g.*, RMD1007 at 3:19-38; Table 1. Accordingly, a POSITA would have been prompted to incorporate *Johnson's* teachings of a thermistor or resistor "sensing electrical component" with the MR810 system to distinguish between tube types that may differ in length, geometry, sensor type, or other characteristics. RMD1003 at ¶¶ 65-66. For example, such combination would have simplified the design and construction of the heated breathing wire circuit and facilitated distinctions between two breathing tube types that differ in mechanical configuration (e.g. having different tube diameters) even where the electrical components (e.g. heater wire, sensors, etc.) are otherwise identical between the two tubes. *Id*. That is, the heated wire circuit could have been designed so that other components of the circuit, such as the heater wire and measuring sensors, could have been selected based on desired performance characteristics rather than being limited to particular heater wires or measuring sensors necessary to arrive at a distinct impedance but that may not be optimal for heating performance.

Accordingly, a POSITA would have readily understood the advantages of identifying a conduit type so that system parameters (e.g. heater wire power, gas

supply, etc.) could be optimized, and that a thermistor or fixed resistor would allow identification of the breathing component upon connection to the humidifier. RMD1003 at ¶¶ 65-67. Based on at least these factors, a POSITA would have been prompted to use a thermistor or fixed resistor, as taught by *Johnson*, in the system described by the *MR810 Manual* so as to facilitate breathing tube identification while simplifying design and construction of the breathing tube circuit. *Id*.

Furthermore, a POSITA would have understood that the use of identification elements having a characteristic impedance in respiratory system applications was known in the art at the time of the '345 patent. RMD1003 at ¶ 67. For example, as discussed above, *Figley* describes using a resistor to identify a component connected to a respiratory system, such as cannula connectors. RMD1029 at 16:25-35; RMD1003 at ¶ 67. Given that identification elements were known with respiratory systems, a POSITA would have readily considered applying *Johnson*'s teachings to identify component types in a respiratory system, such as the system described by the *MR810 Manual*, in order to improve upon the respiratory system. *Id.*

3. The *MR810 Manual*, in view of *Gradon, Edirisuriya, and Johnson*, discloses all the limitations of claims 1-11

The following claim chart sets forth in detail exemplary disclosure from the *MR810 Manual*, *Gradon*, *Edirisuriya*, and *Johnson* showing how the combination of these references discloses each element of claims 1-11.

'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Johnson***
[1.1]	*See* Ground 2, [1.1], *supra*.
[1.2]	*See* Ground 2, [1.2], *supra*.
[1.3]	*See* Ground 2, [1.3], *supra*.
[1.4]	*See* Ground 2, [1.4], *supra*.
[1.5]	The *MR810 Manual*, including a resistor or thermistor identification element in series with the heater wire (e.g. provided by the thermistor temperature sensor or an additional thermistor or resistor) as taught by *Gradon, Edirisuriya*, and *Johnson*, discloses a heater wire utilized in an electrical circuit including at least one identification element having a characteristic impedance. RMD1003 at ¶ 66; *see also* Ground 2, [1.5], *supra*. *Johnson* describes a "sensing electrical component 113 (such as a resistor, [or] thermistor . . .) is utilized . . . to provide an electrical signature indication of battery type." RMD1007 at 2:64-68; 3:19-39; RMD1003 at ¶ 63. *Gradon's* thermistor temperature sensor, or an additional resistor or thermistor, connected with the heater wire, exhibits a characteristic impedance range at a given temperature such that the thermistor can be used as an identification element, as taught by *Johnson*. *See* RMD1003 at ¶¶ 65-66; RMD1005 at 8:28-34, FIG. 5; Ground 2, [1.5], *supra*.
[1.6]	*See* Ground 2, [1.6], *supra*.
[1.7]	The *MR810 Manual,* including an identification component as taught by *Gradon, Edirisuriya*, and *Johnson,* discloses wherein the controller is adapted to measure the characteristic impedance of the identification element. RMD1003 at ¶ 68. The *MR810*

'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Johnson***
	Manual describes that its controller identifies the type of breathing circuit that is connected based on measuring the impedance of the heated wire circuit, and determines whether to initiate heater-wire mode of control based on the measured impedance. *See, e.g.*, RMD1006 at FIG. 3.2; 3.5.1; Ground [1.7], *supra*. Furthermore, the resulting combination provides measurement of the characteristic impedance of the identification element (*Gradon's* thermistor or an additional resistor or thermistor) connected with the heater wire. RMD1003 at ¶¶ 65-68. The system described by the *MR810 Manual* then identifies the type of breathing circuit that is connected, and whether to initiate the "heater-wire mode of control," by comparing the measured impedance to predetermined ranges (e.g. "between 10 and 28 Ω"). *See, e.g., id.*; RMD1006 at 3.5.1; Ground 2, [1.7], *supra*..
[1.8]	The *MR810 Manual* in view of *Gradon, Edirisuriya*, and *Johnson* discloses a humidifier controller configured to identify a delivery conduit based on the characteristic impedance of the identification element. *See* RMD1006 at 3.5.1; RMD1003 at ¶¶ 65-68. The MR810 device identifies a conduit as either a "heated breathing circuit" or an "unheated breathing circuit" by comparing the measured characteristic impedance to predetermined ranges. RMD1006 at FIG. 3.2; 3.5.1; *see also* Ground 2, [1.6]-[1.8], *supra*. *Johnson* describes its resistor or thermistor has "a different value of resistance" for each component type, such that "the sense input voltage" detected is "a different value" for each component type. *See id.* at 3:19-38; RMD1003 at ¶ 64.
[1.9]	*See, e.g.*, Ground 2, [1.9], *supra*.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Johnson***
[2.1]	*See, e.g.*, Ground 2, [1.1]-[1.9], *supra*.

'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Johnson***
[2.2]	*See, e.g.*, Ground 2, [2.2], *supra*.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya, and/or Johnson***
[3.1]	*See, e.g.*, Ground 2, [1.1]-[1.9], *supra*.
[3.2]	*Johnson* discloses wherein said characteristic impedance is a thermistor resistance range (e.g. "1K-2K" ohms). *See, e.g.*, RMD1007 at 3:19-38; Table 1.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya, and/or Johnson***
[4.1]	*See, e.g.*, Ground 2, [1.1]-[1.9], *supra*.
[4.2]	The *MR810 Manual* in view of *Gradon and* Edirisuriya, incorporating a fixed resistor "sensing electrical component" as taught by Johnson, discloses the identification element is a fixed resistor. *See, e.g.*, RMD1007 at 2:64-68; Table 1.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya, and/or Johnson***
[5.1]	*See, e.g.*, Ground 2, [5.1], *supra*.
[5.2]	*See, e.g.*, Ground 2, [5.2], *supra*.
[6.1]	*See, e.g.*, Ground 2, [1.1]-[1.9], *supra*.
[6.2]	*Johnson* discloses a controller configured to measure a characteristic impedance and compare it with a plurality of predetermined impedance ranges. *Johnson* expressly provides six predetermined impedance ranges to identify the presence or absence of a component. *See, e.g.*, RMD1007 at 3:19-38; Table 1. The *MR810 Manual* describes that "connecting" a heated wire breathing circuit will "automatically initiate the heater-wire mode," indicating that the controller measures the characteristic impedance upon connection while the heated wire breathing circuit is still at ambient temperature, in order to identify the conduit type. *See, e.g.*, RMD1006 at 3.5.1; *see also* Ground 1, [1.6] supra. RMD1003 at ¶ 68.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya, and/or Johnson***

'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Johnson***
[7.1]	*See, e.g.*, Ground 3, [5.1]-[5.2], *supra*.
[7.2]	*See, e.g.*, Ground 3, [6.2], *supra*.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon*, *Edirisuriya*, and *Johnson***
[8.1]	The *MR810 Manual* discloses identifying a conduit attached to an apparatus. *See, e.g.*, Ground 1, [1.7]-[1.8], *supra*; RMD1006 at 3.5.1 ("Connecting a heated wire breathing circuit (between 10 and 28 Ω) to the MR810 will automatically initiate the heater-wire mode of control."). *Johnson* teaches a detector that measures an input signal related to the electrical signature of the resistor or thermistor so that a device can be operated in accordance with the particular component that is installed. *See id.* at 3:19-39; RMD1003 at ¶ 63. In particular, *Johnson* describes a "sensing electrical component 113 (such as a resistor, thermistor . . . or other elements which may provide auxiliary sensing capability)" that provides an "electrical signature indication" of a component type. *Id.* at 2:64-68.
[8.2]	The *MR810 Manual*, including a resistor or thermistor identification element in series with the heater wire as taught by *Gradon, Edirisuriya*, and *Johnson*, discloses a heater wire utilized in an electrical circuit including at least one identification element having a characteristic impedance. RMD1003 at ¶ 68. *Johnson* describes a "sensing electrical component 113 (such as a resistor, [or] thermistor . . .) is utilized . . . to provide an electrical signature indication of battery type." RMD1007 at 2:64-68; 3:19-39; RMD1003 at ¶ 63. The resistor or thermistor identification element (e.g. the thermistor temperature sensor or an additional thermistor or resistor) in series with the heater wire exhibits a characteristic impedance range and serves as an identification element. See RMD1003 at ¶¶ 65-68; RMD1005 at 8:28-34, FIG. 5; see also Ground 3, [1.5], supra.

'345 Patent Claims	Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Johnson*
	Edirisuriya teaches that "the heater wire itself could be used to carry electrical signals from measuring sensors," indicating the heater wire is utilized in an electrical circuit with the identification element having a characteristic impedance, provided by the resistor or thermistor. RMD1004 at ¶ [0070].
[8.3]	*See, e.g.*, Ground 3, [1.7], *supra*.
[8.4]	The *MR810 Manual*, including a resistor or thermistor identification element in series with the heater wire as taught by *Gradon, Edirisuriya*, and *Johnson*, discloses comparing said measured characteristic impedance with a predetermined impedance value. RMD1003 at ¶¶ 60-61. The *MR810 Manual* describes that its device identifies which type of breathing circuit is connected, and whether to initiate the heater-wire mode of control, by comparing the measured characteristic impedance to the predetermined range of "10 and 28 Ω." *See, e.g.*, RMD1004 at FIG. 3.2; 3.5.1; *see also* Ground 3, [8.4]. *Johnson* discloses a controller configured to measure a characteristic impedance and compare it with a plurality of predetermined impedance ranges. *See, e.g.*, RMD1007 at 3:19-38; Table 1; Ground 3, [6.2], *supra*.
[8.5]	*See, e.g.,* Ground 3, [1.9], *supra*.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya, and/or Johnson***
[9.1]	*See, e.g.*, Ground 2, [9.1], *supra*.
[9.2]	*See, e.g.*, Ground 2, [9.2], *supra*.
'345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya, and/or Johnson***
[10.1]	*See, e.g.*, Ground 2, [10.1], *supra*.
[10.2]	*See, e.g.*, Ground 3, [6.2], *supra*.
[10.3]	The *MR810 Manual*, in view of *Gradon*, *Edirisuriya*, and *Johnson*, discloses that applying power is based on the predetermined range that said measured characteristic impedance is in. For example, *Johnson* describes "[o]perational characteristics . . . are

’345 Patent Claims	Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya,* and *Johnson*
	modified in accordance with the battery type detected,” and in particular, describes “the output power of transmitter 117 can be adjusted to a maximum power level determined by the particular battery type connected.” RMD1007 at 4:29-60. The *MR810 Manual* describes that the controller applies power based on the range the characteristic impedance is in by “initiat[ing] the heater-wire mode” based on a characteristic impedance within the first predetermined range “between 10 and 28 Ω,” and not applying heating wire power if the characteristic impedance is in a different range (*e.g.*, a range between 0 and 10 Ω or a range greater than 28 Ω). *See, e.g.*, RMD1006 at 3.5.1; *see also* Ground 1, [6.2], [8.5], *supra*; RMD1003 at ¶ 68.
’345 Patent Claims	**Exemplary Disclosure of *MR810 Manual, Gradon, Edirisuriya, and/or Johnson***
[11.1]	*See, e.g.*, Ground 2, [9.1]-[9.2], *supra*.
[11.2]	*See, e.g.*, Ground 3, [10.2], *supra*.
[11.3]	*See, e.g.*, Ground 3, [10.3], *supra*.

IX. GROUNDS 1, 2, AND 3 ARE NOT REDUNDANT

Petitioners submit Grounds 1 and 2, which both apply to claims 1-2 and 4-11, are not redundant. In particular, Ground 2 applies additional secondary references—*Gradon*, *Edirisuriya,* and *Figley*—that are not asserted in Ground 1, to the extent the claims are narrowly construed. These secondary references of Ground 2 disclose different structures than the structures applied in Ground 1. Furthermore, Ground 1 and 2 are based on different legal standards, with Ground 1 being based on anticipation and Ground 2 being based on obviousness. For at least

these reasons, Ground 1 presents issues that are substantively different from those in Ground 2, and IPR should be instituted on both Grounds.

Further, Petitioners submit Ground 3, which applies to claims 1-11, is not redundant to Grounds 1 and 2. In particular, Ground 3 applies an additional secondary reference—*Johnson*—that is not asserted in Grounds 1 or 2. This secondary reference discloses different structures than the structures applied in Grounds 1 and 2. Furthermore, Grounds 1 and 3 are based on different legal standards, with Ground 1 being based on anticipation and Ground 3 being based on obviousness. For at least these reasons, Ground 3 presents issues that are substantively different from those in Grounds 1 and 2, and IPR should be instituted on all three Grounds.

X. CONCLUSION

Claims 1-11 of the ’345 patent are unpatentable pursuant to Grounds 1-3 set forth above. Accordingly, Petitioners request *inter partes* review of these claims.

Respectfully submitted,

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(Trial No. IPR2016-01723)

CERTIFICATION UNDER 37 CFR § 42.24(d)

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for Inter Partes Review totals 13,803, which is less than the 14,000 allowed under 37 CFR § 42.24(a)(1(i).

Respectfully submitted,

Date: September 7, 2016

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(1) and 42.105, the undersigned certifies that on September 7, 2016, a complete and entire copy of this Petition for *Inter Partes* Review, and all supporting exhibits, were provided via FedEx to the Patent Owner by serving the correspondence address of record as follows:

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