

Filed on behalf of ResMed Corp.

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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RESMED CORP.,  
Petitioner

v.

CLEVELAND MEDICAL DEVICES, INC.,  
Patent Owner

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Case IPR2025-00158

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**PETITION FOR *INTER PARTES* REVIEW OF  
U.S. PATENT NO. 11,690,512**

Claims 1-20

## TABLE OF CONTENTS

|             |                                                                                                                                                              |          |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>I.</b>   | <b>INTRODUCTION .....</b>                                                                                                                                    | <b>1</b> |
| <b>II.</b>  | <b>IDENTIFICATION OF CHALLENGES.....</b>                                                                                                                     | <b>2</b> |
| <b>III.</b> | <b>BACKGROUND .....</b>                                                                                                                                      | <b>3</b> |
|             | A. Overview of the Technology.....                                                                                                                           | 3        |
|             | B. '512 Patent.....                                                                                                                                          | 3        |
|             | C. Challenged Claims .....                                                                                                                                   | 4        |
|             | D. Prosecution History .....                                                                                                                                 | 5        |
| <b>IV.</b>  | <b>THE PRIOR ART.....</b>                                                                                                                                    | <b>5</b> |
|             | A. Ciulla (EX1007) .....                                                                                                                                     | 5        |
|             | B. Orbach (EX1008) .....                                                                                                                                     | 6        |
|             | C. Kumar (EX1009).....                                                                                                                                       | 7        |
|             | D. Nagai (EX1010) .....                                                                                                                                      | 7        |
|             | E. Truschel (EX1011).....                                                                                                                                    | 8        |
| <b>V.</b>   | <b>LEVEL OF ORDINARY SKILL.....</b>                                                                                                                          | <b>8</b> |
| <b>VI.</b>  | <b>CLAIM CONSTRUCTION.....</b>                                                                                                                               | <b>9</b> |
| <b>VII.</b> | <b>GROUND 1: CIULLA IN VIEW OF ORBACH RENDERS OBVIOUS CLAIMS 1-6, 8-17, 19, AND 20 .....</b>                                                                 | <b>9</b> |
|             | A. Motivation to Combine Ciulla with Orbach.....                                                                                                             | 9        |
|             | 1. Wirelessly Transferring Sleep Data from Wearable Device to Cell Phone via Bluetooth, and from Cell Phone to Remote Site via Cell Towers [1.b], [1.e]..... | 10       |
|             | 2. Hardwiring Sensors [1.b.iii].....                                                                                                                         | 13       |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 3. | Software on Phone and Remote Site [1.a], [1.d] .....                                                                                                                                                                                                                                                                                                                                                                     | 15 |
| B. | Reasonable Expectation of Success .....                                                                                                                                                                                                                                                                                                                                                                                  | 16 |
| C. | Independent Claim 1 .....                                                                                                                                                                                                                                                                                                                                                                                                | 18 |
| 1. | Preamble: <i>Sleep Diagnostic Data Acquisition System</i> .....                                                                                                                                                                                                                                                                                                                                                          | 18 |
| 2. | [1.a]: <i>First Software On Cell Phone Or PDA Comprising<br/>First Wireless Transceiver and First Processor</i> .....                                                                                                                                                                                                                                                                                                    | 21 |
| a. | Ciulla.....                                                                                                                                                                                                                                                                                                                                                                                                              | 22 |
| b. | Orbach.....                                                                                                                                                                                                                                                                                                                                                                                                              | 22 |
| 3. | [1.b]: <i>Portable, Wearable Patient Interface Box Secured<br/>To Subject At First Location; Providing Single Device<br/>Measuring And Wirelessly Transferring Sleep Data From<br/>Sensors Diagnosing Sleep Disorders</i> .....                                                                                                                                                                                          | 24 |
| a. | Ciulla.....                                                                                                                                                                                                                                                                                                                                                                                                              | 24 |
| b. | Orbach.....                                                                                                                                                                                                                                                                                                                                                                                                              | 28 |
| 4. | [1.b.i]: <i>Rigid Enclosure</i> .....                                                                                                                                                                                                                                                                                                                                                                                    | 30 |
| 5. | [1.b.ii]: <i>Battery</i> .....                                                                                                                                                                                                                                                                                                                                                                                           | 32 |
| 6. | [1.b.iii.A]: <i>Electrical Component[] Within Box Receiving<br/>Electrical Signals From Sensors, Signal Processing Unit<br/>Receiving Electrical Signals From Sensors; [1.b.iii.B]:<br/>Sensors Attached To Subject And/Or Within Box;<br/>[1.b.iii.C]: Sensors Hardwired To Box And/Or Built<br/>Within Box; [1.b.iii.D]: Signal Processing Unit Receiving<br/>And Processing Sleep Data From Input Channel[]</i> ..... | 33 |
| 7. | [1.b.iv.A]: <i>Second Wireless Transceiver Or Transmitter<br/>Operat[es] Above 2 GHz; [1.b.iv.B]:Transmit[s] Sleep<br/>Data Collected With The Box Wirelessly To First<br/>Wireless Transceiver Of Cell Phone Or PDA With First<br/>Software Loaded</i> .....                                                                                                                                                            | 38 |

|     |                                                                                                                                                                                                                                                                                           |    |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 8.  | [1.c]: <i>Two Sensors Selected From Group: Accelerometer(s), Pulse oximeter(s) Including Fingertip Pulse Oximeter(s) And Built Into Box, RIP Belt(s), Respiratory Effort Belt(s), Pressure Sensor(s), Microphone(s), Strain Gauge(s), Pressure Transducer(s), and Transducer(s)</i> ..... | 40 |
| 9.  | [1.c.i.A]: <i>Sensors Applied To Subject; [1.c.i.B]: When Sensors Built Into Box, Applied to Finger, Arm And/Or Torso</i> .....                                                                                                                                                           | 42 |
| 10. | [1.c.ii]: <i>Sensors Measure Or Derive Respiratory Ventilation Directly Or Indirectly, Blood Oxygenation, And Body Position During Testing</i> .....                                                                                                                                      | 44 |
|     | a. Respiratory Ventilation (Direct) .....                                                                                                                                                                                                                                                 | 44 |
|     | b. Respiratory Ventilation (Indirect) .....                                                                                                                                                                                                                                               | 45 |
|     | c. Blood Oxygenation .....                                                                                                                                                                                                                                                                | 47 |
|     | d. Body Position .....                                                                                                                                                                                                                                                                    | 47 |
|     | e. During Testing .....                                                                                                                                                                                                                                                                   | 47 |
| 11. | [1.c.iii]: <i>Sensors Releasably Connected And/Or Hardwired Or Within The Box</i> .....                                                                                                                                                                                                   | 47 |
| 12. | [1.d]: <i>Second Software At Site Remote To First Location</i> .....                                                                                                                                                                                                                      | 48 |
| 13. | [1.e]: <i>First Software Wirelessly Receive[s] And Re-Transmit[s] Sleep Data, Or Optionally Send[s] Sleep Data Further Processed With First Processor, With First Wireless Transceiver Over Cell Towers To Computer Or Second Processor For Analysis</i> .....                            | 49 |
| 14. | [1.f]: <i>Second Software Analyze[s], Output[s], And/Or Format[s] Sleep Data At Remote Site</i> .....                                                                                                                                                                                     | 52 |
| 15. | [1.g]: <i>Second Software Displays Both, In Part, Sleep Data And/Or Analyzed Sleep Data For Diagnosis Of</i>                                                                                                                                                                              |    |

|    |                                                                                                                                                                                 |           |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|    | <i>Sleep Disorder, And If Necessary, Provide Basis To<br/>Modify Sleep Treatment .....</i>                                                                                      | <i>52</i> |
| D. | Dependent Claims 2-6, 8-17, 19, and 20.....                                                                                                                                     | 54        |
| 1. | Claim 2: <i>Third Sensor Measur[es] Respiratory<br/>Ventilation Such As Respiratory Effort and/or Snore.....</i>                                                                | <i>54</i> |
| 2. | Claim 3: <i>Third Sensor Measur[es] Respiratory Effort;<br/>Fourth Sensor Measur[es] Snore .....</i>                                                                            | <i>56</i> |
| 3. | Claim 10: <i>Sensors Consist Of Pulse Oximeter And<br/>Accelerometer .....</i>                                                                                                  | <i>56</i> |
| a. | “Consist Of...” .....                                                                                                                                                           | 57        |
| b. | Pulse Oximeter Used For Diagnos[is], Respiratory<br>Ventilation, and Blood Oxygenation .....                                                                                    | 58        |
| c. | “Accelerometer” Used For Diagnos[is] and Body<br>Position .....                                                                                                                 | 58        |
| 4. | Claims 4/11/15: <i>Transmit Sleep Data to Remote Internet<br/>Site or Communication Station Using First Transceiver<br/>Over Cell Towers and/or Internet For Analysis .....</i> | <i>59</i> |
| 5. | Claims 5/12/16: <i>Two-Way Bi-Directional Data<br/>Transmission Between Two Transceivers .....</i>                                                                              | <i>60</i> |
| 6. | Claim 6/13/17: <i>Remote Control Sleep Data Transmission<br/>From First Transceiver and/or First Software When<br/>Executed By Cell Phone or PDA .....</i>                      | <i>61</i> |
| 7. | Claim 8/14/19: <i>Software Filter Determines One Or More<br/>Of Airflow, Tidal Volume, Ventilation Rate, and Snore<br/>Detection From Sleep Data .....</i>                      | <i>62</i> |
| 8. | Claim 9/20: <i>Box Comprises A/D Converter And Digital<br/>Memory For Receiving Sleep Data.....</i>                                                                             | <i>64</i> |

|                                                                                                              |           |
|--------------------------------------------------------------------------------------------------------------|-----------|
| <b>VIII. GROUND 2: CIULLA IN VIEW OF ORBACH AND NAGAI RENDERS OBVIOUS CLAIMS 1-6, 8-17, 19, AND 20 .....</b> | <b>65</b> |
| A. Motivation to Combine Ciulla-Orbach with Nagai.....                                                       | 65        |
| B. Reasonable Expectation of Success .....                                                                   | 66        |
| C. Independent Claim 1 .....                                                                                 | 67        |
| D. Dependent Claim 10.....                                                                                   | 68        |
| 1. Claim 10. <i>Sensors Consist Of Pulse Oximeter And Accelerometer</i> .....                                | 68        |
| a. Only Two Sensors .....                                                                                    | 69        |
| b. Pulse Oximeter.....                                                                                       | 69        |
| c. Accelerometer.....                                                                                        | 70        |
| E. Dependent Claims 2-6, 8-9, 11-17, 19, and 20 .....                                                        | 70        |
| <b>IX. GROUND 3: CIULLA IN VIEW OF ORBACH AND TRUSCHEL RENDERS OBVIOUS CLAIMS 7 AND 18.....</b>              | <b>70</b> |
| A. Motivation to Combine Ciulla-Orbach with Truschel .....                                                   | 71        |
| B. Reasonable Expectation of Success .....                                                                   | 71        |
| C. Dependent Claims 7 and 18 .....                                                                           | 72        |
| 1. Claim 7/18. <i>Software Filter Extracts High Frequency To Obtain Snore Signal</i> .....                   | 72        |
| <b>X. GROUND 4: CIULLA IN VIEW OF ORBACH AND KUMAR RENDERS OBVIOUS CLAIMS 6, 8, 13-14, 17, AND 19 .....</b>  | <b>73</b> |
| A. Motivation to Combine Ciulla-Orbach with Kumar .....                                                      | 73        |
| B. Reasonable Expectation of Success .....                                                                   | 74        |
| C. Dependent Claims 6, 8, 13-14, 17, and 19 .....                                                            | 74        |

|               |                                                                                                                  |           |
|---------------|------------------------------------------------------------------------------------------------------------------|-----------|
| 1.            | Claim 6/13/17.....                                                                                               | 74        |
| 2.            | Claim 8/14/19.....                                                                                               | 76        |
| <b>XI.</b>    | <b>GROUND 5: CIULLA IN VIEW OF ORBACH, KUMAR, AND TRUSCHEL RENDERS OBVIOUS CLAIMS 7 AND 18.....</b>              | <b>76</b> |
| <b>XII.</b>   | <b>GROUND 6: CIULLA IN VIEW OF ORBACH, NAGAI, AND KUMAR RENDERS OBVIOUS CLAIMS 6, 8, 13, 14, 17, AND 19.....</b> | <b>76</b> |
| <b>XIII.</b>  | <b>GROUND 7: CIULLA IN VIEW OF ORBACH, NAGAI, AND TRUSCHEL RENDERS OBVIOUS CLAIMS 7 AND 18.....</b>              | <b>77</b> |
| <b>XIV.</b>   | <b>GROUND 8: CIULLA IN VIEW OF ORBACH, NAGAI, AND KUMAR, AND TRUSCHEL RENDERS OBVIOUS CLAIMS 7 AND 18.....</b>   | <b>77</b> |
| <b>XV.</b>    | <b>SECONDARY CONSIDERATIONS .....</b>                                                                            | <b>78</b> |
| <b>XVI.</b>   | <b>THE BOARD SHOULD REACH THE MERITS.....</b>                                                                    | <b>78</b> |
| A.            | No Denial Under <i>Advanced Bionics</i> .....                                                                    | 78        |
| B.            | No Denial Under <i>Fintiv</i> .....                                                                              | 79        |
| <b>XVII.</b>  | <b>MANDATORY NOTICES .....</b>                                                                                   | <b>79</b> |
| A.            | Real Parties-in-Interest.....                                                                                    | 79        |
| B.            | Related Matters.....                                                                                             | 79        |
| C.            | Notice of Counsel and Service Information.....                                                                   | 80        |
| D.            | Fee for <i>Inter Partes</i> Review .....                                                                         | 81        |
| E.            | Grounds for Standing .....                                                                                       | 81        |
| <b>XVIII.</b> | <b>CONCLUSION .....</b>                                                                                          | <b>81</b> |
|               | <b>CLAIM APPENDIX .....</b>                                                                                      | <b>83</b> |

## TABLE OF AUTHORITIES

|                                                                                                                              | <b>Page(s)</b> |
|------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Cases</b>                                                                                                                 |                |
| <i>Adv. Energy Indus. Inc. v. Reno Tech. Inc.</i> ,<br>IPR2021-01397, Paper 7, (PTAB Feb. 16, 2022).....                     | 78             |
| <i>Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte<br/>GmbH</i> ,<br>IPR2019-01469, Paper 6 (Feb. 13, 2020) ..... | 78             |
| <i>Amazon.com, Inc. v. M2M Sols. LLC</i> ,<br>IPR2019-01205, Paper 14 (PTAB Jan. 27, 2020) .....                             | 78             |
| <i>Apple Inc. v. Fintiv, Inc.</i> ,<br>IPR2020-00019, Paper 11 (Mar. 11, 2020) .....                                         | 79             |
| <i>Bracco Diagnostics Inc. v. Maia Pharmaceuticals, Inc.</i> ,<br>839 Fed. App'x 479 (Fed. Cir. 2020) .....                  | 34             |
| <i>Cochlear Bone Anchored Sols. AB v. Oticon Med. AB</i> ,<br>958 F.3d 1348 (Fed. Cir. 2020) .....                           | 34             |
| <i>In re Crish</i> ,<br>393 F.3d 1253 (Fed. Cir. 2004) .....                                                                 | 57             |
| <i>Fasteners for Retail, Inc. v. RTC Indus., Inc.</i> ,<br>IPR2019-00994, Paper 9 (PTAB Nov. 5, 2019).....                   | 78             |
| <i>In re Gunaji</i> ,<br>Appeal 2022-002519, 5 (PTAB May 15, 2023) .....                                                     | 57             |
| <i>Intel Corporation v. PACT XPP Schweiz AG</i> ,<br>61 F.4th 1373 (Fed. Cir. 2023) .....                                    | 14             |
| <i>KSR Intern Co. v. Teleflex, Inc.</i> ,<br>550 U.S. 398 (2007).....                                                        | 15, 18, 67, 74 |
| <i>Mylan Pharm. Inc., v. Merck Sharp &amp; Dohme Corp.</i> ,<br>IPR2020-00040, Paper 21, 8, 18 (PTAB Mafy 12, 2020).....     | 78             |

|                                                                                                     |        |
|-----------------------------------------------------------------------------------------------------|--------|
| <i>ResMed Corp., v. Cleveland Medical Devices, Inc.,</i><br>1:23-cv-02221-BMB (N.D. Ohio.) .....    | 79, 82 |
| <i>Target Corp. v. Proxicom Wireless, LLC,</i><br>IPR2020-00904, Paper 11 (PTAB Nov. 10, 2020)..... | 9      |
| <i>Vivint, Inc. v. SB IP Holdings LLC,</i><br>IPR2022-00811, Paper 16 (PTAB Nov. 3, 2023).....      | 15     |

## **Statutes**

|                       |      |
|-----------------------|------|
| 35 U.S.C. § 103 ..... | 2, 3 |
|-----------------------|------|

## **Other Authorities**

|                            |    |
|----------------------------|----|
| 37 C.F.R. § 42.10(b) ..... | 81 |
| 37 C.F.R. § 42.15(a).....  | 81 |
| 37 C.F.R. §42.24(a).....   | 88 |
| 37 C.F.R. § 42.24(d) ..... | 88 |
| 37 C.F.R. §42.100(b) ..... | 9  |
| 37 C.F.R. § 42.104(a)..... | 81 |

**TABLE OF EXHIBITS**

| <b>Exhibit No.</b> | <b>Description</b>                                                                                         |
|--------------------|------------------------------------------------------------------------------------------------------------|
| 1001               | U.S. Patent No. 11,690,512 to Kayyali (“the ’512 Patent”)                                                  |
| 1002               | File History of U.S. Patent No. 11,690,512                                                                 |
| 1003               | Declaration of Jason Kirkness, Ph.D. (“Kirkness”)                                                          |
| 1004               | Curriculum Vitae of Jason Kirkness, Ph.D.                                                                  |
| 1005               | Declaration of Sandeep Chatterjee, Ph.D. (“Chatterjee”)                                                    |
| 1006               | Curriculum Vitae of Sandeep Chatterjee, Ph.D.                                                              |
| 1007               | U.S. Patent Application Publication No. 2003/0199945 to Ciulla (“Ciulla”)                                  |
| 1008               | World Intellectual Property Organization International Publication No. WO 2006/090371 to Orbach (“Orbach”) |
| 1009               | U.S. Patent Application Publication No. 2002/0198473 to Kumar (“Kumar”)                                    |
| 1010               | U.S. Patent Application Publication No. 2006/0173257 to Nagai (“Nagai”)                                    |
| 1011               | U.S. Patent Application Publication No. 2003/0066529 to Truschel (“Truschel”)                              |
| 1012               | U.S. Patent Application Publication No. 2006/0183469 to Gadson (“Gadson”)                                  |
| 1013               | U.S. Patent Application Publication No. 2002/0090939 to Howard (“Howard”)                                  |

| Exhibit No. | Description                                                                 |
|-------------|-----------------------------------------------------------------------------|
| 1014        | U.S. Patent Application Publication No. 2004/0016433 to Estes (“Estes”)     |
| 1015        | U.S. Patent No. 5,947,115 to Lordo (“Lordo”)                                |
| 1016        | U.S. Patent No. 5,746,699 to Fredberg (“Fredberg”)                          |
| 1017        | Specification of the Bluetooth System, Bluetooth, v1.0 B (Dec. 1, 1999)     |
| 1018        | U.S. Patent No. 5,684,460 to Scanlon (“Scanlon”)                            |
| 1019        | U.S. Patent Application Publication No. 2004/0034293 to Kimball (“Kimball”) |
| 1020        | U.S. Patent Application Publication No. 2008/0319277 to Bradley (“Bradely”) |
| 1021        | U.S. Patent No. 6,712,762 to Lichter (“Lichter”)                            |
| 1022        | U.S. Patent Application Publication No. 2002/0032386 to Sackner (“Sackner”) |
| 1023        | U.S. Patent No. 6,083,156 to Lisiecki (“Lisiecki”)                          |
| 1024        | U.S. Patent No. 4,825,872 to Tan (“Tan”)                                    |
| 1025        | U.S. Patent Application Publication No. 2006/0174871 to Jagger (“Jagger”)   |
| 1026        | U.S. Patent Application Publication No. 2009/0240125 to Such (“Such”)       |
| 1027        | U.S. Patent No. 5,790,040 to Kreier (“Kreier”)                              |

| Exhibit No. | Description                                                                                                                                                                                                                                                                                                                                       |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1028        | U.S. Patent Application Publication No. 2007/0208232 to Kovacs (“Kovacs”)                                                                                                                                                                                                                                                                         |
| 1029        | Research Challenges in Wireless Networks of Biomedical Sensors, L. Schwiebert (2001), accessed at <a href="https://citeseerx.ist.psu.edu/document?repid=rep1&amp;type=pdf&amp;doi=200613bf402b54be0179483813f7f98a5ae053ef">https://citeseerx.ist.psu.edu/document?repid=rep1&amp;type=pdf&amp;doi=200613bf402b54be0179483813f7f98a5ae053ef</a> . |
| 1030        | U.S. Patent No. 6,236,906 to Müller (“Müller”)                                                                                                                                                                                                                                                                                                    |
| 1031        | U.S. Patent No. 5,774,113 to Barnes (“Barnes”)                                                                                                                                                                                                                                                                                                    |
| 1032        | U.S. Patent No. 5,002,170 to Parsons (“Parsons”)                                                                                                                                                                                                                                                                                                  |
| 1033        | U.S. Patent Application Publication No. 2003/0163054 to Dekker (“Dekker”)                                                                                                                                                                                                                                                                         |
| 1034        | U.S. Patent No. 5,437,275 to Amundsen (“Amundsen”)                                                                                                                                                                                                                                                                                                |
| 1035        | U.S. Patent No. 7,575,005 to Mumford (“Mumford”)                                                                                                                                                                                                                                                                                                  |
| 1036        | U.S. Patent Application Publication No. 2007/0208262 to Kovacs (“Kovacs”)                                                                                                                                                                                                                                                                         |
| 1037        | U.S. Patent Application Publication No. 2004/0133079 to Mazar (“Mazar”)                                                                                                                                                                                                                                                                           |
| 1038        | U.S. Patent No. 6,658,292 to Kroll (“Kroll”)                                                                                                                                                                                                                                                                                                      |
| 1039        | U.S. Patent No. 7,130,689 to Turcott (“Turcott”)                                                                                                                                                                                                                                                                                                  |
| 1040        | A. Silberschatz, “Operating System Concepts” (1994) (“Silberschatz 1994”)                                                                                                                                                                                                                                                                         |

| Exhibit No. | Description                                                                                                                                                       |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1041        | U.S. Patent Application Publication No. 2007/0002837 to Tan (“Tan”)                                                                                               |
| 1042        | U.S. Patent Application Publication No. 2006/0283446 to Chua (“Chua”)                                                                                             |
| 1043        | U.S. Patent Application Publication No. 2006/0224074 to Ouchi (“Ouchi”)                                                                                           |
| 1044        | U.S. Patent Application Publication No. 2002/0029004 to Starr (“Starr”)                                                                                           |
| 1045        | U.S. Patent Application Publication No. 2007/0273504 to Tran (“Tran”)                                                                                             |
| 1046        | S. Thompson et al., “Sleep as a Teaching Tool for Integrating Physiology and Motor Control,” <i>Advances in Physiology Education</i> (2001) (“Thompson 2001”)     |
| 1047        | U.S. Patent No. 5,704,345 to Berthon-Jones (“Berthon-Jones 345”)                                                                                                  |
| 1048        | U.S. Patent No. 7,168,429 to Matthews et al. (“Matthews”)                                                                                                         |
| 1049        | C.W. Lillebei et al., “Transistor Pacemaker for Treatment of Complete Atrioventricular Dissociation,” <i>JAMA</i> , 172(18): 2006 - 2010 (1960) (“Lillehei 1960”) |
| 1050        | D. Rapoport, “Methods to Stabilize the Upper Airway Using Positive Pressure,” <i>Sleep</i> 19(9): S123-S130 (1996) (“Rapoport 1996”)                              |
| 1051        | NASA, “Applications of Aerospace Technology in Biomedicine, Patient Monitoring” (1971) (NASA 1971)                                                                |
| 1052        | M. Weil, et al., “Experience With a Digital Computer for Study and Improved Management of the Critically Ill,” <i>JAMA</i> , 198:1011 - 1016 (1966) (“Weil 1966”) |

| Exhibit No. | Description                                                                                                                                                                                                                             |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1053        | L. Clark et al., “Electrode Systems for Continuous Monitoring in Cardiovascular Surgery,” 29-45 (1962) (“Clark & Lyons 1962”)                                                                                                           |
| 1054        | H. Kennedy et al., “Ambulatory (Holter) Electrocardiography Using Real-Time Analysis,” 1190-1195 (1987) (“Kennedy 1987”)                                                                                                                |
| 1055        | S. Wilber, et. al., “Patient Monitoring and Anesthetic Management: A Physiological Communications Network,” JAMA, 191:893-898 (1965) (“Wilber 1965”)                                                                                    |
| 1056        | C. Lilly, et. al., “Critical Care Telemedicine: Evolution and State of the Art,” Critical Care Medicine, 42:2429-2436 (2014) (“Lilly 2014”)                                                                                             |
| 1057        | M. Breslow, et. al., “Effect of a multiple-site intensive care unit telemedicine program on clinical and economic outcomes: An alternative paradigm for intensivist staffing,” Critical Care Medicine, 32:31-38 (2004) (“Breslow 2004”) |
| 1058        | K. Zundel, “Telemedicine: history, applications, and impact on librarianship,” Bull Med Lib. Assoc., 84:71-79 (1996) (“Zundel 1996”)                                                                                                    |
| 1059        | Loube, D., “Technologic Advances in the Treatment of Obstructive Sleep Apnea Syndrome,” CHEST, 116:1426-1433 (1999) (“Loube 1999”)                                                                                                      |
| 1060        | A. Boudewyns, et. al., “Two months follow up of auto-CPAP treatment in patients with obstructive sleep apnoea,” Thorax, 54:147-149 (1999) (“Thorax 1060”)                                                                               |
| 1061        | D. Lankford, “Wireless CPAP Patient Monitoring: Accuracy Study,” Telemedicine Journal and e-Health, 10:162-169 (2004) (“Lankford 2004”)                                                                                                 |
| 1062        | D. Claremont et al., “Biosensors for Continuous in Vivo Glucose Sensors”, IEEE Engineering In Medicine & Biology Society 10th                                                                                                           |

| Exhibit No. | Description                                                                                                                                                                                                                                                  |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | Annual International Conference, 740-741 (1988) (“Claremont 1988”)                                                                                                                                                                                           |
| 1063        | A. Berssenbrugge et al., “Mechanisms of Hypoxia-Induced Periodic Breathing During Sleep In Humans,” 343: 507-524 (“Berssenbrugge 1983”)                                                                                                                      |
| 1064        | H. Colten, “Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem”, <a href="https://docs.wind-watch.org/Sleep-Disorders-Sleep-Deprivation.pdf">https://docs.wind-watch.org/Sleep-Disorders-Sleep-Deprivation.pdf</a> (2006) (“Colten 2006”) |
| 1065        | W. Flemons, “Home Diagnosis of Sleep Apnea: A Systematic Review of the Literature” CHEST, 124:1543-1579 (2003), (“Flemons 2003”)                                                                                                                             |
| 1066        | R. Stoohs et al., MESAM 4: “An Ambulatory Device for the Detection of Patients at Risk for Obstructive Sleep Apnea Syndrome (OSAS)”, CHEST 101(5): 1221-27 (1992) (Stoohs & Guilleminault, 1992)                                                             |
| 1067        | K. Rebrin et al., “Subcutaneous glucose predicts plasma glucose independent of insulin: implications for continuous monitoring,” 561-571 (“Rebrin 1999”)                                                                                                     |
| 1068        | C. George, “Diagnostic Technologies in Obstructive Sleep Apnea,” 355-366 (199) (“George 1999”)                                                                                                                                                               |
| 1069        | N. Keijsers, “Online Monitoring of Dyskinesia in Patients with Parkinson’s Disease,” 93-103 (May/June 2003) (Keijsers 2003)                                                                                                                                  |
| 1070        | ResMed Corp.’s Opening Claim Construction Brief, <i>ResMed Corp., v. Cleveland Medical Devices</i> , Case No. 1:23-cv-02221-BMB (N.D. Ohio Nov. 25, 2024)                                                                                                    |
| 1071        | U.S. Patent Application Publication No. 2002/0185130 to Wright (“Wright”)                                                                                                                                                                                    |

| <b>Exhibit No.</b> | <b>Description</b>                                                                                  |
|--------------------|-----------------------------------------------------------------------------------------------------|
| 1072               | Japan Patent Office Patent Application Pub. No. P2002-291889A to Toge (“Toge”)                      |
| 1073               | D. Gourley, et. al., HTTP The Definitive Guide (2002)                                               |
| 1074               | D. Mauro, et. al., Essential SNMP (2001)                                                            |
| 1075               | F. Adelstein, et. al., Fundamentals of Mobile and Pervasive Computing (2005)                        |
| 1076               | World Intellectual Property Organization International Publication No. WO0145014A1 to Quay (“Quay”) |

## **I. INTRODUCTION**

ResMed Corp. (“Petitioner”) respectfully requests *inter partes* review of claims 1-20 of U.S. Patent No. 11,690,512 (EX1001, “’512 Patent”).

For a brief background, pervasive computing started in the early 1990s. In the early 2000s, sensor diagnostic devices such as heart and sleep monitors were being incorporated into networked systems. Numerous benefits motivated such incorporation, including greater data access and convenience to patients, doctors, and providers.

The ’512 Patent is directed to a wearable sleep diagnostic data acquisition system that transmits sleep data to a PDA or cell phone and remote site. But by 2006 (the ’512 Patent’s earliest possible priority date), this was nothing more than an obvious combination of known wearable sleep diagnostic data acquisition systems (like taught by U.S. Patent Pub. No. 2003/0199945 to Ciulla (EX1007, “Ciulla”)) and networked wearable sleep data monitoring systems (like taught by WO2006/090371 to Orbach (EX1008, “Orbach”)).

Petitioner respectfully requests the Board institute review and find all challenged claims of the ’512 Patent unpatentable.

## II. IDENTIFICATION OF CHALLENGES<sup>1</sup>

**Ground 1:** Claims 1-6, 8-17, 19, and 20 are obvious under 35 U.S.C. § 103 over Ciulla (EX1007)<sup>2</sup> in view of Orbach (EX1008).<sup>3</sup>

**Ground 2:** Claims 1-6, 8-17, 19, and 20 are obvious under 35 U.S.C. § 103 over Ciulla in view of Orbach and Nagai (EX1010).<sup>4</sup>

**Ground 3:** Claims 7 and 18 are obvious under 35 U.S.C. § 103 over Ciulla in view of Orbach and Truschel (EX1011).<sup>5</sup>

**Ground 4:** Claims 6, 8, 13-14, 17, and 19 are obvious under 35 U.S.C. § 103 over Ciulla in view of Orbach and Kumar (EX1009).<sup>6</sup>

**Ground 5:** Claims 7 and 18 are obvious under 35 U.S.C. § 103 over Ciulla in view of Orbach, Kumar, and Truschel.

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<sup>1</sup> References to prior art other than that asserted in each ground demonstrate the state of art.

<sup>2</sup> Ciulla is at least §§102(a), (b), and (e) prior art.

<sup>3</sup> Orbach is at least §102(e) prior art.

<sup>4</sup> Nagai is at least §102(e) prior art.

<sup>5</sup> Truschel is at least §§102(a), (b), and (e) prior art.

<sup>6</sup> Kumar is at least §§102(a), (b), and (e) prior art.

**Ground 6:** Claims 6, 8, 13, 14, 17, and 19 are obvious under 35 U.S.C. § 103 over Ciulla in view of Orbach, Nagai, and Kumar.

**Ground 7:** Claims 7 and 18 are obvious under 35 U.S.C. § 103 over Ciulla in view of Orbach, Nagai, and Truschel.

**Ground 8:** Claims 7 and 18 are obvious under 35 U.S.C. § 103 over Ciulla in view of Orbach, Nagai, Kumar, and Truschel.

### **III. BACKGROUND**

#### **A. Overview of the Technology**

Acquiring patient physiological sleep data early is critical to early detection and accurate diagnosis of sleep disorders. By the early 2000s, advances in wearable technology and mobile health solutions made it possible to continuously and non-invasively collect physiological data. *See generally* EX1064, Ch. 6; EX1065; *e.g.*, EX1007, EX1008.

#### **B. '512 Patent**

The '512 Patent describes a well-known approach for acquiring physiological data from patients. EX1001, Abstract, FIG. 1, 16:8-61.

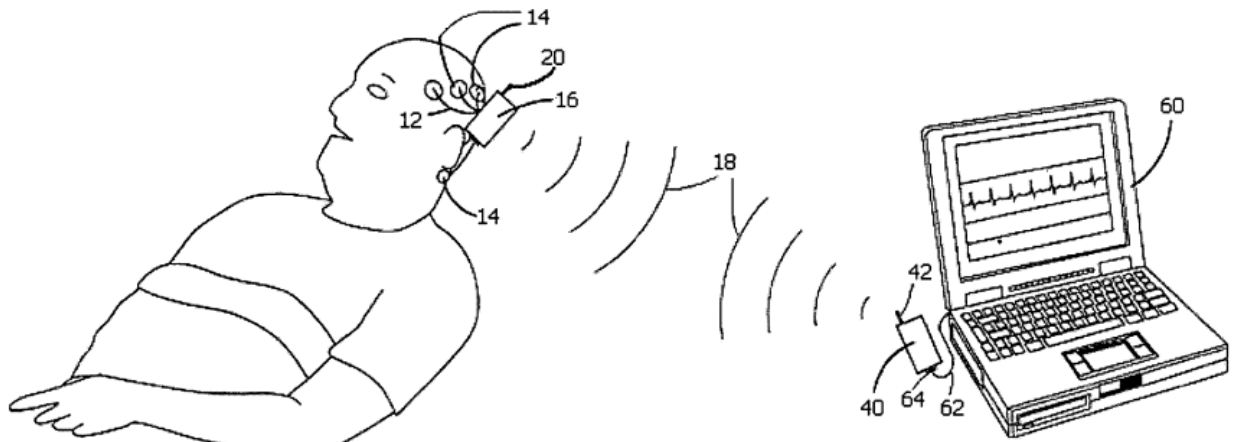


**Fig. 1**

Various sensors 14 are attached to a subject and measure the patient's physiological data. *Id.*, 16:8-61, 8:67-9:9. The physiological data is input to a module 16, which wirelessly transmits a signal 18 to a base station 40, such as over "Bluetooth." *Id.*, 16:8-61, 10:45-53. The base station can be a "cell phone..., which...optionally re-processes the information, and re-transmits the information via cell towers...to a remote site for analysis." *Id.*, 15:39-44.

### **C. Challenged Claims**

The challenged claims are entitled to an effective filing date of no earlier than June 16, 2006.<sup>7</sup> The '512 Patent has 20 claims, 1 independent claim and 19 dependent claims. Independent claim 1 is generally directed to a system with three components:

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<sup>7</sup> Petitioner does not concede this priority date.

- (1) a first software on a PDA or cell phone to wirelessly transmit and receive sleep data;
- (2) a portable, wearable interface box to measure sleep data including at least two sensors and send sleep data to the PDA or cell phone;
- (3) a second software on a remote processor to analyze and display the sleep data.

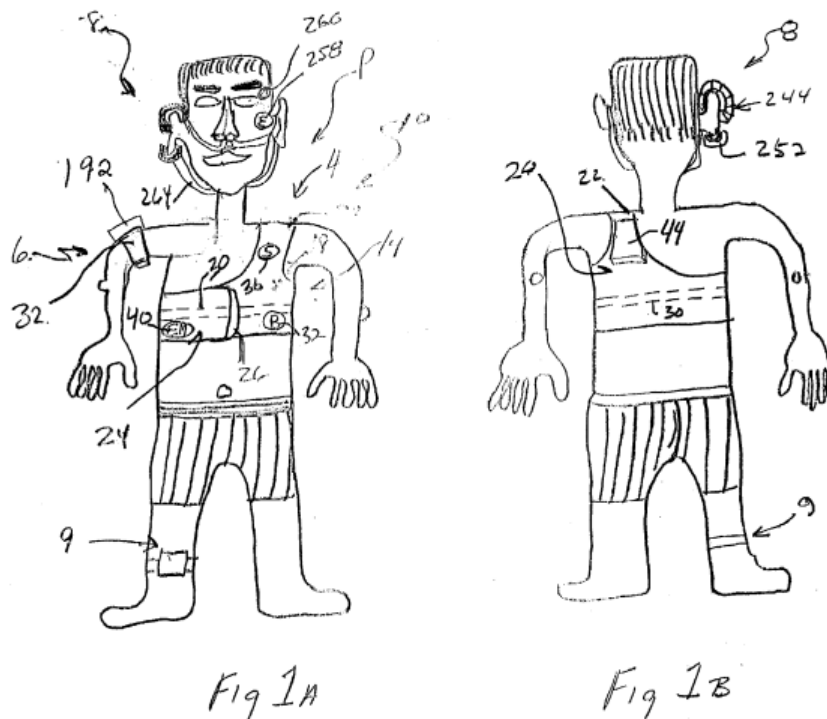
#### **D. Prosecution History**

The applicant quickly obtained allowance of the '512 Patent by overcoming objections and indefiniteness rejections and filing a terminal disclaimer over parent U.S. Patent No. 11,576,577. EX1002, 96-112, 150-151, 159-165, 170-177.

### **IV. THE PRIOR ART**

#### **A. Ciulla (EX1007)**

Ciulla discloses a patient-wearable device for diagnosing and treating sleep disordered breathing. EX1007, Abstract, [0095]-[0106], [0219], [0078]-[0079], FIGs. 1A, 1B.



Various sensors are hard-wired or wirelessly connected to, or “incorporated within” a main module 44 worn on the patient’s back. *Id.*, [0100], [0106], [0124], [0145]. The device “transmit[s] the multiple sensors’ outputs wirelessly” for “further analysis.” *Id.*, [0213]-[0214].

#### **B. Orbach (EX1008)**

Orbach discloses wearable sensor modules (110) that sense a user’s physiological data and transmit the data to a cell phone that retransmits the data to a remote server. EX1008, Abstract, FIG. 1, 13:21-14:2, 14:3-15:15, 22:3-27.

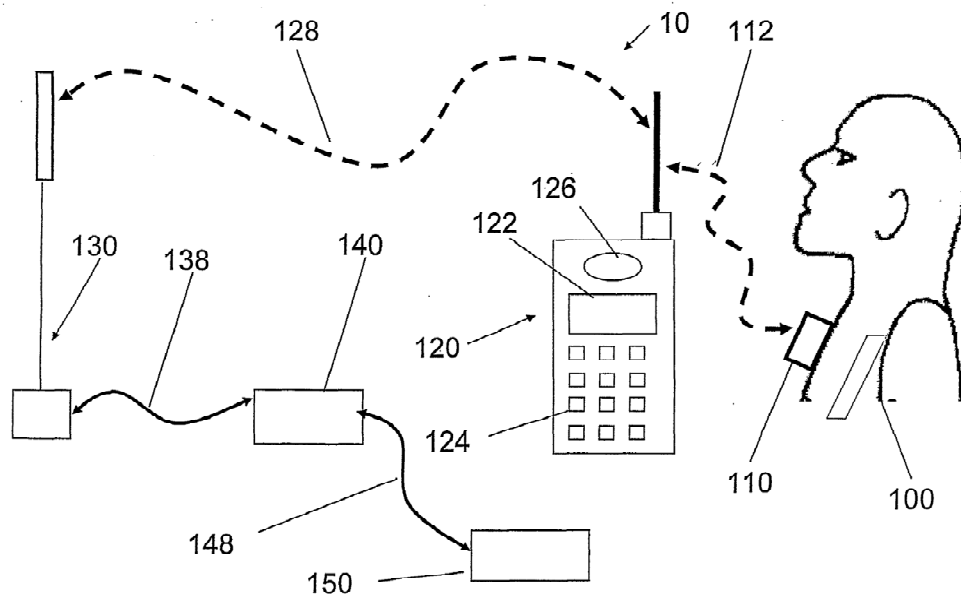


**Fig. 1**

*Id.*, FIG. 1. When the remote server receives the sensor data, an expert reviews the data to “help identify and possibly correct sleep disorders.” EX1008, 13:14-14:2, 22:20-23:4, 41:25-27, 44:1-11.

**C. Kumar (EX1009)**

Kumar discloses a patient-side device that senses sleep information. EX1009, [0071], [0015], [0068], [0239]-[0241]. A provider remotely controls readout of the patient sensor data via a stream manager running on the patient’s PDA or wireless telephone. *Id.*, [0015], [0080], [0085].

**D. Nagai (EX1010)**

Nagai “evaluat[es] sleep of subjects in diagnosing sleep” disorders using two sensors. EX1010, [0003]. Nagai’s “body position detector 12” is an accelerometer that “detects a body position of the subject.” *Id.*, [0047], [0049], [0070]-[0071], FIG.

1. Nagai considers pulse oximeter information with body position information to determine a “correlation between apnea and body position of the subject in sleep.” *Id.*, [0172], [0142]-[0145].

**E. Truschel (EX1011)**

Truschel teaches a “snore analysis device 64” and “digital band pass filter 58,” implemented within a controller 50 using “suitable programming.” EX1011, [0043], [0046]. The filter detects snoring from sensed pressure. *Id.*, [0043], [0045]-[0046], [0050], [0068], [0053].

**V. LEVEL OF ORDINARY SKILL**

A person of ordinary skill in the art (“POSITA”) in 2006 would have had at least a bachelor’s degree in mechanical engineering, electrical engineering, computer science, biomedical engineering, or a similar technical field, with at least two years of relevant product design experience working with diagnostic sensor systems and network data systems. Additional experience could substitute for less education, and additional education could likewise substitute for less experience. Kirkness, ¶¶42-63; Chatterjee, ¶¶20-23.<sup>8</sup>

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<sup>8</sup> Petitioner submits the declarations of Jason Kirkness, Ph.D (EX1003) and Sandeep Chatterjee, Ph.D (EX1005), experts in the field(s) of the ’512 Patent. (EX1003, ¶¶1-30; EX1004; EX1005, ¶¶1-14; EX1006.)

This Petition does not turn on this precise definition, and the challenged claims would be unpatentable from the perspective of any reasonable person of ordinary skill in the art at the relevant time. Kirkness, ¶¶42-63.

## VI. CLAIM CONSTRUCTION

The Board construes the claims “using the same claim construction standard that would be used” in district courts. 37 C.F.R. §42.100(b). This Petition establishes the prior art meets each of the claim limitation under any reasonable construction.<sup>9</sup> Thus, no express construction is required.

## VII. GROUND 1: CIULLA IN VIEW OF ORBACH RENDERS OBVIOUS CLAIMS 1-6, 8-17, 19, AND 20

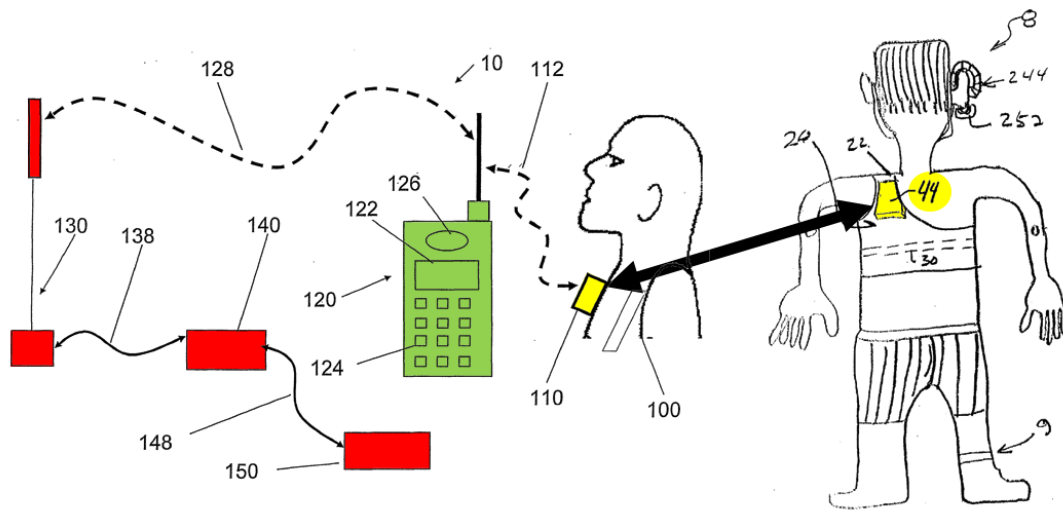
### A. Motivation to Combine Ciulla with Orbach

It would have been obvious to a POSITA to modify Ciulla’s *sleep diagnostic data acquisition system* (Section VII.C.1) to transmit its sensor data via a cell phone (or PDA) to a remote computer for sleep disorder diagnosis like in Orbach. Kirkness, ¶¶64-93, 104-117; Chatterjee, ¶¶24-56, 70-86. Such combination would have resulted in the modified *sleep diagnostic data acquisition system* of Ciulla that

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<sup>9</sup> Petitioner reserves all rights to raise claim construction and other arguments (§112, etc.) in other proceedings. *See, e.g., Target Corp. v. Proxicom Wireless, LLC*, IPR2020-00904, Paper 11 at 11-13 (PTAB Nov. 10, 2020).

would have included the preamble of claim 1 and limitations [1.b.iv], and [1.d]-[1.g] as taught by Orbach. *See* Claim Appendix; Kirkness, ¶104. More specifically, this Ground combines Ciulla's wearable sleep data acquisition system (EX1007, FIGs. 1B, 8) with Orbach's cell phone to wirelessly collect and transmit sleep sensor data to a remote computer for processing (EX1008, FIG. 1). Kirkness, ¶104.



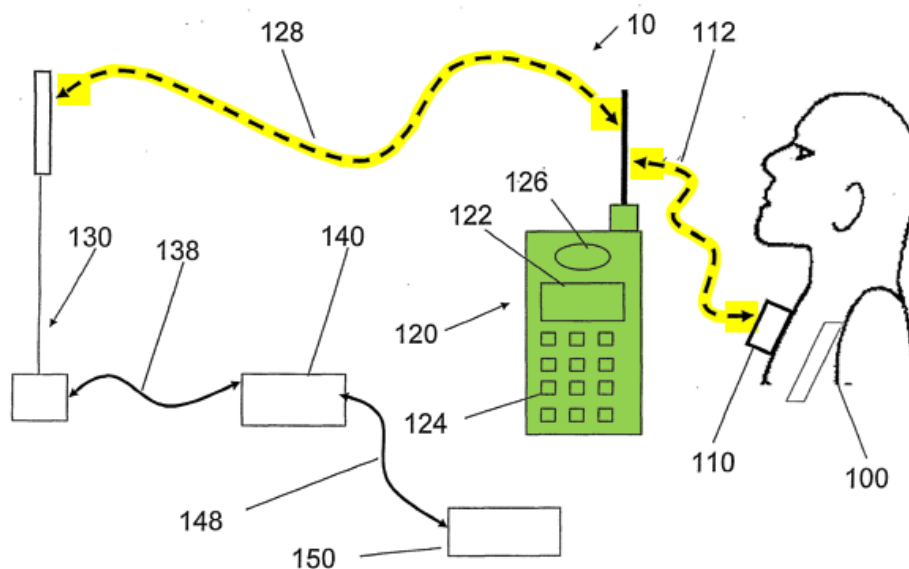
EX1008, FIG. 1 (left) (annotated); EX1007, FIG. 1B (right) (annotated); Kirkness, ¶105. The combination would have resulted in Bluetooth wireless transceivers in the wearable device and cell phone and communication via cell towers for the display, analysis, diagnosis, and treatment of sleep disorders. Kirkness, ¶105.

A POSITA would have been motivated and found it obvious to implement the following modifications to Ciulla. Kirkness, ¶106.

1. **Wirelessly Transferring Sleep Data from Wearable Device to Cell Phone via Bluetooth, and from Cell Phone to Remote**

### Site via Cell Towers [1.b], [1.e]

Ciulla's main module 44 includes "a radio frequency transmitter and receiver for wireless communication." EX1007, [0102], [0106], FIGs. 1A-1B, 8. Moreover, Ciulla discloses "transmit[ting]...multiple sensors' outputs wirelessly." *Id.*, [0213]; *see also id.*, [0219], [0221], [0230]. While Ciulla does not explicitly disclose that its main module 44 wirelessly transmits sensor data to a cell phone or from the cell phone to a remote site, this would have been obvious in view of Orbach. Kirkness, ¶107; EX1008 (Orbach), FIG. 1, 13:21-27 (describing Bluetooth communication link 112 between sensor module and cell phone, and cellular communication link 128 between cell phone and cellular base station), 22:4-13, 22:20-23:4; Sections VII.C.2-3.



EX1008, FIG. 1 (annotated).

First, implementing Orbach's communication techniques in Ciulla would have enabled continuous, real-time data communication, allowing more personalized and timely interventions for users. Kirkness, ¶108; Chatterjee, ¶¶70-81; EX1008, 13:28-14:2, 17:19-20, 38:24-27 (raising alerts "when certain conditions occur"), 25:27-26:2 (receiving "feedback in real time" which is "relevant for health issues").

Second, allowing patients to use a common portable device (cell phone) to track and report health data would have improved early detection of health issues while reducing doctor visits, hospital stays, and healthcare costs. Kirkness, ¶109; Chatterjee, ¶¶70-81; EX1008, FIG. 1. A user would not need a costly custom device to communicate sensor data because relevant software would easily be downloaded to the mobile device, especially considering that mobile devices were increasingly popular and well-connected during the relevant time. EX1008, 22:10-13, 33:24-27; Kirkness, ¶¶109-110; Chatterjee, ¶¶70-81. The combination would have also improved healthcare accessibility in underserved areas with limited access to in-person providers. Kirkness, ¶¶109-110; Chatterjee, ¶¶70-81.

Third, the combination would have promoted greater patient engagement, leading to better outcomes and increased satisfaction with care as individuals became more actively involved in managing their health. Kirkness, ¶111; EX1008, FIGs. 7a-7d (user interfaces for managing health information).

Orbach transmits sensor data over a “cellular RF link to a cellular base station 130” in a corresponding “cellular network.” EX1008, 5:3-5, 13:21-14:2, 22:20-27, 33:27-34:2 (“GSM, GPRS or 3G”); Kirkness, ¶112 To the extent not explicitly disclosed, communications over “*cell towers*” in Orbach’s cellular network would have been obvious for Ciulla-Orbach to operate according to standard cell tower-based networks and increase usability and reach, or to allow Ciulla-Orbach to send data to a remote server from multiple locations over an existing network. Kirkness, ¶112; EX1041, [0007]; EX1012, [0004] (“Cellular telephone systems...minimally include...cell towers.”); EX1013, [0011] (similar).

## 2. **Hardwiring Sensors [1.b.iii]**

To the extent Ciulla does not explicitly disclose hardwiring a fingertip-based pulse oximeter or nasal cannula-type sensor, it would have been obvious to use standard wired sensors for these components, hardwired to Ciulla’s main module 44 through a connector (*e.g.*, a jack, port). Kirkness, ¶113; *see* Section VII.C.6. Ciulla constructs its sleep device “using off-the-shelf sensor inputs,” which “reduce[s] production costs.” EX1007, [0204], [0072], [0226]. Such wired sensors were standard prior to the alleged date of invention. *See, e.g.*, EX1021, 11:16-38 (wired pulse oximeter finger clip); EX1025, [0092] (wired nasal pressure sensor); Kirkness, ¶113; *see* Section VII.C.6; Chatterjee, ¶¶55-56.

Indeed, Ciulla states that hardwiring sensors to module 44 is “more cost effective.” EX1007, [0145], [0072]; Kirkness, ¶114. Consistent with Ciulla, a POSITA would have appreciated that using wired sensors would have beneficially decreased sensor connection complexity, noise, battery bulk, cost, and charging inconveniences as compared to wireless alternatives. EX1026, [0030], [0032]; EX1027, 1:23-21; EX1028, [0102] (wired connection “minimize[s] cost or unwanted RF radiation”), [0116] (wireless transmitters “add significant complexity, power losses, and noise”); Kirkness, ¶114. Moreover, combining wired and wireless functionality was advantageous to optimize energy used “for sending or receiving data, yielding a longer time before the necessary recharge.” EX1029, p. 5 (Section 3.2); Kirkness, ¶114.

A POSITA would have considered tradeoffs of hardwiring versus wireless configurations (*e.g.*, design constraints, cost, user convenience). Kirkness, ¶115; Chatterjee, ¶¶55-56. Although Ciulla mentions that some sensors are “likely” wireless (EX1007, [0125]), such qualified language (“likely”) does not undermine the known benefits of wired sensors. *See, e.g., Intel Corporation v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1379-81 (Fed. Cir. 2023) (prior art combination does not require “the *best* option, only...a *suitable* option”) (emphasis in original). Hardwiring Ciulla’s sensors would have been an obvious and predictable substitution of wireless sensors for wired sensors with a reasonable expectation of

success. *See KSR*, 550 U.S. at 416, 418, 402-403. Indeed, the “known interchangeability of wired and wireless devices” would have been obvious in this context. *See Vivint, Inc. v. SB IP Holdings LLC*, IPR2022-00811, Paper 16 at 27 (PTAB Nov. 3, 2023).

### 3. Software on Phone and Remote Site [1.a], [1.d]

Orbach’s cell phone forwards sensor data to remote server 140, connected to viewing station 150. EX1008, 3:19-23, 5:3-5, 8:11-15, 13:21-14:2, 22:20-27, 33:27-34:2, FIG. 1. The remote server has “programmable data processing power” and storage for “acquiring and storing...records.” *Id.*, 38:19-22, 41:8-24. Orbach’s cell phone includes an “application loaded into the cellular phone memory and executed by the processor within the cellular phone” and “specific programs necessary for interfacing with the sensor module.” *Id.*, 22:4-13, 33:24-26. The cell phone also includes graphical interfaces displaying breathing and other logged data. EX1008, 32:9-30, 33:24-26, 34:3-16, 35:28-36:16, FIGs. 7A-7D; Kirkness, ¶116.

To the extent not disclosed, a POSITA would have found it obvious for Orbach’s remote server and cell phone to include conventional ***executable software stored on a non-transitory computer readable medium*** for receiving, processing, and transmitting data. Kirkness, ¶117; *see* Sections VII.C.12, VII.D.6. For instance, a processor was ubiquitously known to execute software program instructions to perform functions. Kirkness, ¶117. Such a conventional processor communicates

with a non-transitory memory (*e.g.*, a hard disk) to load software programs executed by the processor. Kirkness, ¶117; *e.g.*, EX1040, 29-30 (describing basic computer system components as including CPU, controls, and memory), 37 (for a computer “to do its job of executing programs,” the programs must be stored in memory). Thus, it would have been obvious for Orbach’s remote server and cell phone to execute memory-stored software programs. Kirkness, ¶117. A POSITA would have understood to store Orbach’s software in non-transitory memory for various reasons, including to allow the system to remain functional even if power cycled on/off. Kirkness, ¶117.

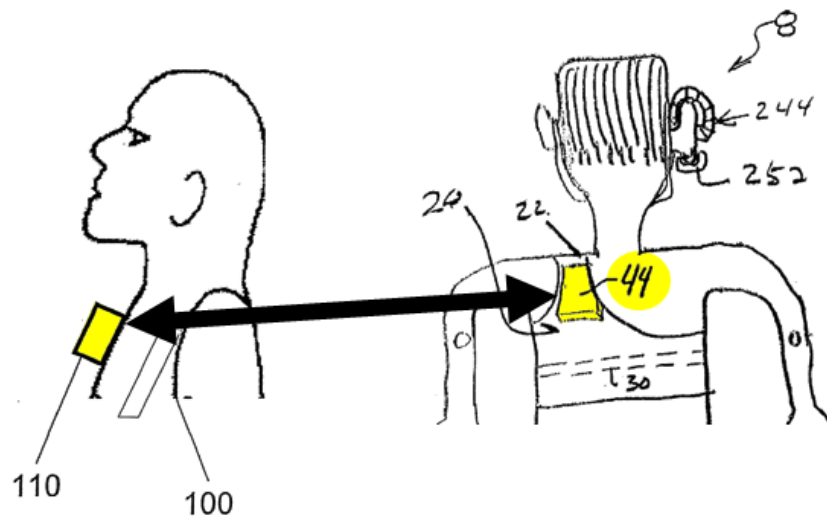
**B. Reasonable Expectation of Success**

A POSITA would have had a reasonable expectation of success in combining Ciulla with Orbach to wirelessly transmit data to a remote computer via a cell phone, hardwire sensors, and implement software on the cell phone and remote computer. Kirkness, ¶¶64-93, 118; Chatterjee, ¶¶82-86.

First, Ciulla already expressly contemplates its sleep device 10 sending sleep data to a remote location for human analysis. EX1007, [0213] (researcher or medical practitioner analyzes “[a]ll sensory data and responses”), [0219] (device is “a diagnostic or screening device for SDB” (Sleep Disordered Breathing)), [0221], [0230]. A POSITA therefore would have had a reasonable expectation of success in implementing Orbach’s networked features. EX1008, Abstract, 13:28-14:2, FIG. 1;

Kirkness, ¶119. Cell phone-based telehealth systems and software were known and common. EX1045, [0217]; EX1009, [0072]; Kirkness, ¶119. Wired sensor connections were also well-known and straightforward to implement. Kirkness, ¶119; *e.g.*, EX1028, [0102], [0116].

Second, Ciulla and Orbach are analogous with readily combinable teachings. Kirkness, ¶120; Chatterjee, ¶85. Both describe sensor monitoring and wireless data acquisition systems for communication, which the '512 Patent identifies as a field of the invention. *E.g.*, EX1007, Abstract, [0213], FIGs. 1A-B, 8; EX1008, Abstract, 13:19-27, FIG. 1; EX1001, 1:24-30; Kirkness, ¶120. Both also disclose wearable modules (main module 44; sensor module 110) receiving sleep data from sensors. EX1007, FIGs. 1B and 8, [0100], [0126]; EX1008, 13:14-15:29, FIG. 1; Kirkness, ¶120.



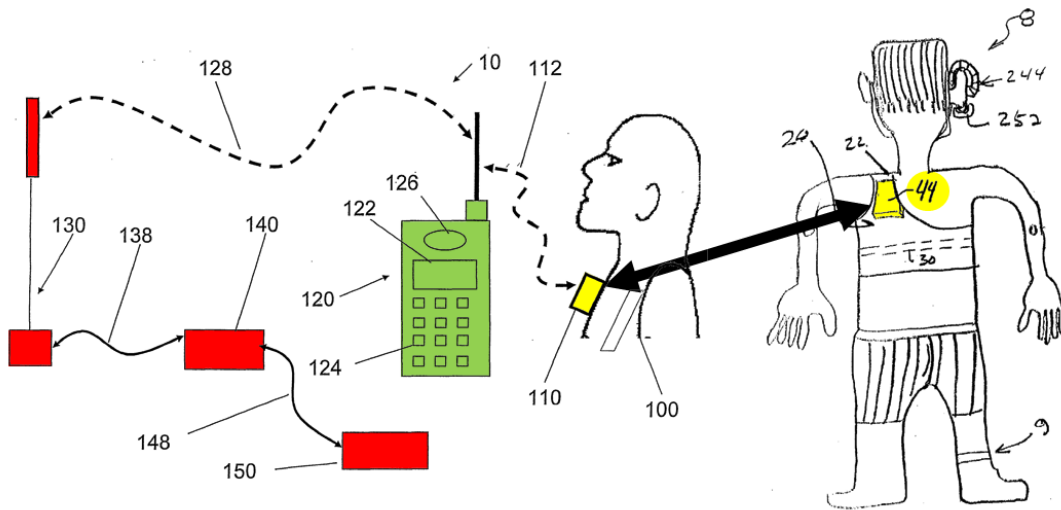
EX1008, FIG. 1 (annotated and excerpted) (left); EX1007, FIG. 1B (annotated and excerpted) (right); Kirkness, ¶120.

The Ciulla-Orbach system would have been a predictable combination of known components according to known methods (*e.g.*, communication and data processing methods), and would have produced the predictable result of wireless/wired transmissions and software as described. Kirkness, ¶121; *KSR Intern Co. v. Teleflex, Inc.*, 550 U.S. 398, 416 (2007); Chatterjee, ¶86.

**C. Independent Claim 1**

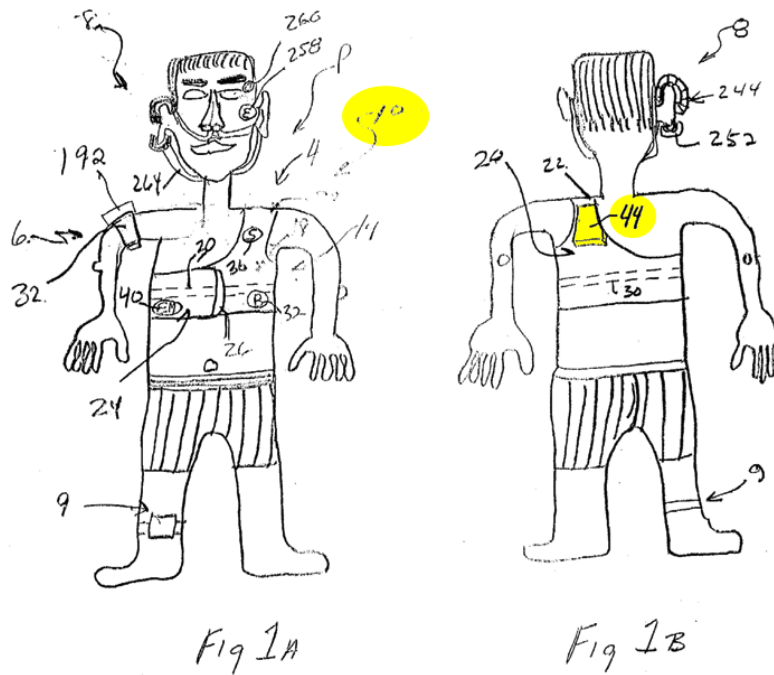
**1. Preamble: *Sleep Diagnostic Data Acquisition System***

To the extent limiting, Ciulla alone or in view of Orbach discloses the preamble. Kirkness, ¶¶122-125; Chatterjee, ¶¶87-91. This Ground combines Ciulla's wearable sleep data acquisition system (*e.g.*, EX1007, FIGs. 1A-1B, 8) with Orbach's teachings of a communication system including a cell phone to transmit sleep sensor data to a remote computer for processing (*e.g.*, EX1008, FIG. 1). Kirkness, ¶122; Chatterjee, ¶88.

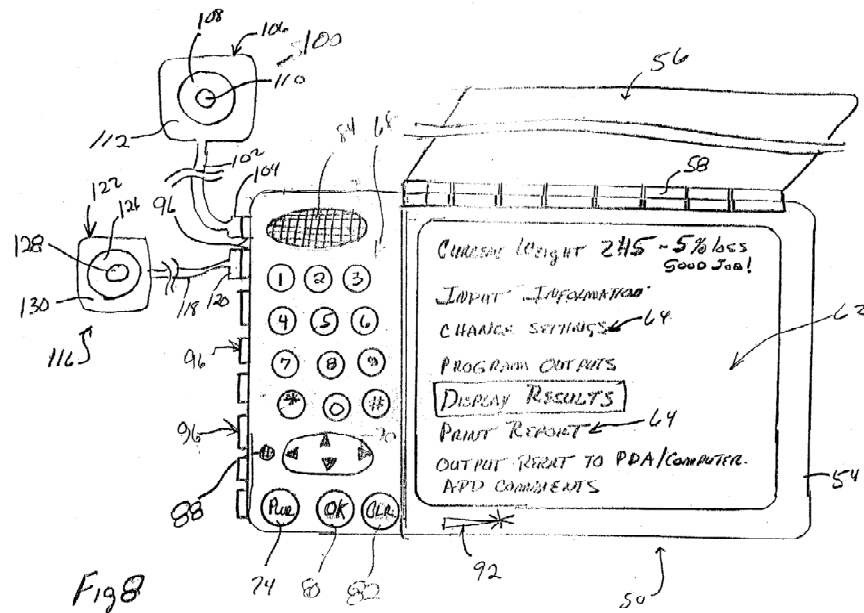


EX1008 (Orbach), FIG. 1 (left) (annotated); EX1007 (Ciulla), FIG. 1B (right) (annotated); Kirkness, ¶122.

Ciulla discloses a wearable “[SDB] treatment device 10” including various sleep sensors. EX1007, [0095], FIGs. 1A-1B, 8 (below). Main module 44 on the patient’s back includes “electronic circuitry that comprises the ‘brains’ of the device 10.” EX1007, [0101], FIG. 8; Chatterjee, ¶89.



EX1007, FIGs. 1A-1B (annotated); Kirkness, ¶123.



EX1007, FIG. 8, [0090] ("FIG. 8 is front, somewhat schematic view of a main module [44]"); Kirkness, ¶123.

Ciulla's sleep device 10 reports sleep data and "serve[s] as a diagnostic or screening device for SDB,"<sup>10</sup> such that the sleep device and related features (as modified by Orbach) are *[a] sleep diagnostic data acquisition system*.<sup>11</sup> EX1007, [0219], [0230] ("monitoring, control and analyses...in a different location from where the patient is sleeping"); *see also id.*, [0221] ( "a full SDB home screening device"), FIGs. 1A-1B, 8, Abstract, [0095]-[0108], [0120]-[0125]; Kirkness, ¶124. The device is configured so that "[a]ll sensory data and responses...can be recorded and analyzed by [a]...medical practitioner." EX1007, [0213], [0230].

The Ciulla-Orbach combination renders obvious various additional features of the *sleep diagnostic data acquisition system* as explained below. Kirkness, ¶125; Chatterjee, ¶¶90-91. The specific disclosures are combined and supported by the motivations to combine and reasonable expectation of success analysis in Sections VII.A-B.

2. ***[1.a]: First Software On Cell Phone Or PDA Comprising First Wireless Transceiver and First Processor***

Ciulla in view of Orbach discloses this limitation. Kirkness, ¶¶126-132; Chatterjee, ¶¶92-104.

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<sup>10</sup> Emphasis added in this Petition unless stated otherwise.

<sup>11</sup> Bold italicized text in this Petition quotes claim language.

**a. Ciulla**

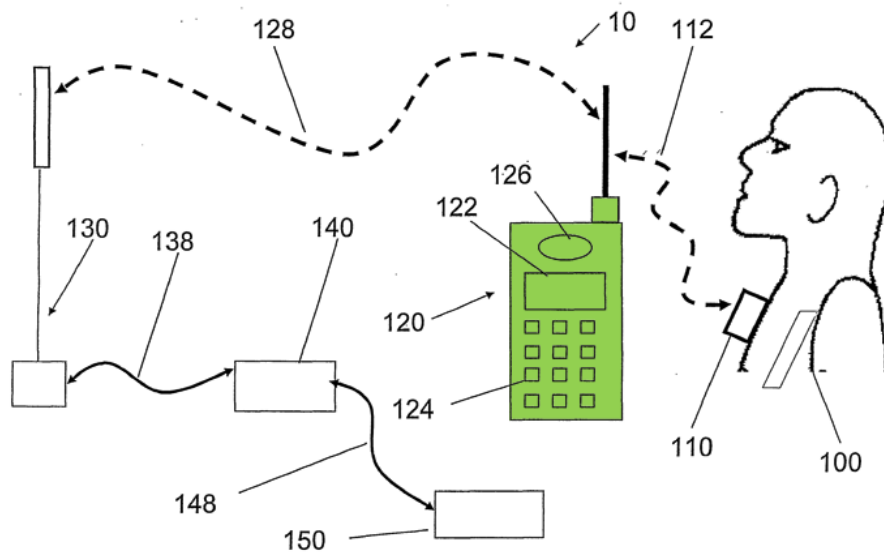
Ciulla's sleep device 10 transmits sensor data to a medical practitioner (EX1007, [0213]) for diagnosing or screening SDB (*id.*, [0219], [0221], [0230]). *See* Section VII.C.1. While Ciulla does not explicitly disclose the details of such communications, a POSITA would have looked to Orbach for its cell phone/PDA with software and corresponding hardware teachings for receiving sleep data and transmitting it to a remote site. Kirkness, ¶¶127-128; VII.A-B; Chatterjee, ¶93.

**b. Orbach**

Orbach, like Ciulla, discloses a sensor data communication system. Kirkness, ¶¶129-130; Chatterjee, ¶94. Orbach's "wearable sensor modules sens[e]...physiological parameters." EX1008, Abstract. A sensor module 110 is "attached to a user 100" and transmits sensor data to a mobile monitor 120 (which is a "cellular phone or a [PDA]") (*cell phone or PDA*)<sup>12</sup> via a wireless communication link 112, as illustrated below in Figure 1. *Id.*, 13:14-27, 14:3-15:15, 22:3-27.

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<sup>12</sup> Orbach's mobile monitor 120 is a cell phone or PDA. While the Petition references Orbach's mobile monitor and cell phone teachings, the same teachings would have also applied to a PDA. Kirkness, ¶130, n.3; EX1008, 22:3-23:4.



*Id.*, FIG. 1 (annotated).

Orbach discloses *a first software stored on a non-transitory computer readable medium and executable by a first processor, the software configured to be loaded on a cell phone or PDA*. Kirkness, ¶131; Chatterjee, ¶¶100-104. For instance, Orbach’s *cell phone* is “loaded” with “specific programs necessary for interfacing with the sensor module” (EX1008, 22:4-13), which includes wirelessly receiving sleep data from the sensors (*see* [1.e]). “[A]n application” (together with the programs, forming the *first software*) is “loaded into the cellular phone memory” (*non-transitory computer readable medium*) and “executed by the processor within the cellular phone” (*first processor*). *Id.*, 33:24-26, 22:4-9; *see also id.*, 38:19-22 (system is “equipped with programmable data processing power”). As configured, the “application” and programs are “*loaded*” and therefore also *stored* in the *cell phone’s* memory, and are *executable by the first processor*. Kirkness, ¶131.

Orbach further discloses that *the cell phone* comprises *at least one first wireless transceiver and the first processor*. Kirkness, ¶132; Chatterjee, ¶¶95-99. Orbach's processor is "within" *the cell phone*, meaning the phone comprises *the first processor*. EX1008, 33:26; Kirkness, ¶132. For *first wireless transceiver*, Orbach's *cell phone* includes "means to communicate with both sensor module and remote server." EX1008, 22:4-9. As a POSITA would have understood, such a communications means is a *first wireless transceiver*, confirmed by Orbach's Figure 1 depicting the mobile monitor 120 having an antenna. Kirkness, ¶132. Orbach's *cell phone* hardware includes a *first wireless transceiver* to enable transmitting/receiving data over the "Bluetooth" communication link 112 with the sensor module 110, and over the "cellular RF" communication link 128 with a remote server 140. EX1008, 13:14-27, 16:13-20, 22:20-27, FIG. 1; Kirkness, ¶132.

3. [1.b]: *Portable, Wearable Patient Interface Box Secured To Subject At First Location; Providing Single Device Measuring And Wirelessly Transferring Sleep Data From Sensors Diagnosing Sleep Disorders*

Ciulla in view of Orbach discloses this limitation. Kirkness, ¶¶133-142; Chatterjee, ¶¶105-118.

a. **Ciulla**

Ciulla's sleep device 10 includes "main module 44," which is *a portable, wearable patient interface box*. EX1007, [0090], [0095], [0100], FIGs. 1B, 8;

Kirkness, ¶134; Chatterjee, ¶106. Main module 44 is **portable, wearable**, and **adapted to be secured to a subject at a first location** because it includes “batteries” and can be worn “on the back of the patient” as the patient sleeps, walks around, and otherwise goes about their day. EX1007, [0078]-[0079], [0095], [0100], [0102], [0183], [0185] (describing the patient moving while wearing the device), FIGs. 1A-1B. Chatterjee, ¶¶109-110.

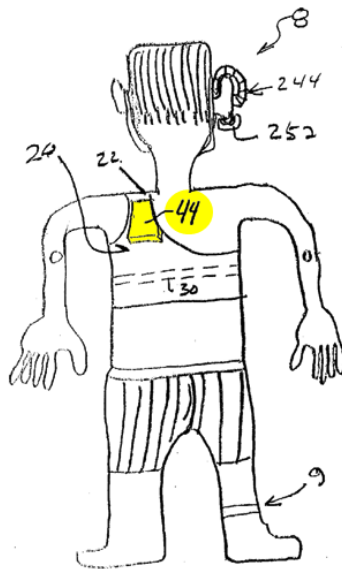


Fig 1B

EX1007, FIG. 1B (annotated); Kirkness, ¶134.

Ciulla’s main module 44 is a **patient interface box**. Kirkness, ¶135; Chatterjee, ¶106. According to the ’512 Patent, an interface box includes a device that “protect[s]...electrical components,” “allow[s]...connection of various sensors,” and is “secured to or held by the subject.” EX1001, 7:15-24; Chatterjee,

¶¶106-107. Ciulla's main module 44 similarly includes a case 50 that protects and "houses the electronic circuitry." EX1007, [0101], [0126]. The main module includes sensor data processing circuits and communication jacks and ports that allow user (*patient*) to *interface* with the box by connecting various sensors to internal electrical components. *Id.*, [0101]-[0107], [0112], [0121]-[0123], [0126]-[0128], FIGs. 1B, 8. Moreover, main module 44 has an input device 66, buttons, and an LCD display, which provide a *patient interface* on the box for the user to control the sleep device. EX1007, [0101]-[0107], [0112], [0121]-[0123], [0126]-[0128], FIGs. 1B, 8; Chatterjee, ¶108.

Ciulla's main module 44 (*box*) *provid[es] a single device for measuring and wirelessly transferring*. EX1007, FIGs. 1B, 8, [0079], [0090], [0100], [0123], [0126], [0128]; Kirkness, ¶136; Chatterjee, ¶¶111, 115. Ciulla depicts and describes the main module 44 as a *single device*. EX1007, [0079], [0090], [0100], [0176] ("a single device to be used with a series of many patients"), FIGs. 1B, 8. Main module 44 is *for measuring...sleep data from at least two sensors*. Kirkness, ¶136; Chatterjee, ¶112. For instance, main module 44 is connected to *at least two sensors* (e.g., attitude sensor; breathing sensor 32; snoring sensor 36; oximeter; nasal cannula-type sensor 264; heart rate monitor), which sense data "during a sleeping episode" (EX1007, [0128]) and is therefore while the user is sleeping (*sleep data from at least two sensors*) and communicate the sensed data to the main module 44.

EX1007, [0100], [0106]-[0107], [0118]-[0119], [0121], [0123]-[0126], [0128], [0143], [0202], [0219], [0230], [0145], FIGs. 1A-1B, 8; *see* Section VII.C.1. The main module 44 *measur[es] sleep data* by converting analog sensor data to digital data and/or “processing the information sensed” to, for instance, “distinguish[] between snoring...[and] total obstruction.” EX1007, [0060], [0067], [0073], [0123], [0126], [0128], [0204] (“analog to digital converter”); Kirkness, ¶136. Main module 44 also receives and *measur[es]* the *sleep data* (EX1007, Abstract, [0060], [0106], [0123], [0126]), consistent with the ’512 Patent’s generic description that the system’s sensors “measure” various physiological parameters that are transmitted to an interface box that also measures the data (EX1001, 3:23-24, 8:67-9:9 (stating the “sensors or devices” measure), 10:5-6, 20:57-67). Kirkness, ¶136. Thus, Ciulla’s main module 44 *measures* various sensor inputs as a *single device* in the same configuration as the ’512 Patent discloses. EX1001, 16:62-17:48. Indeed, Ciulla’s single device is hardwired to certain sensors, as claimed in [1.b.iii]. *Infra*, VII.C.6.

In Ciulla, the *sleep data* and *sensors* are *used for diagnosing sleep disorders*. EX1007, [0123], [0128], [0200], [0202], [0219], [0230]; Kirkness, ¶137; Chatterjee, ¶114. For instance, Ciulla’s sensor data is recorded and reported, and the device “serve[s] as a diagnostic or screening device for SDB.” EX1007, [0219]; *see also id.*, [0126], [0128], [0200], [0213], [0221], [0230].

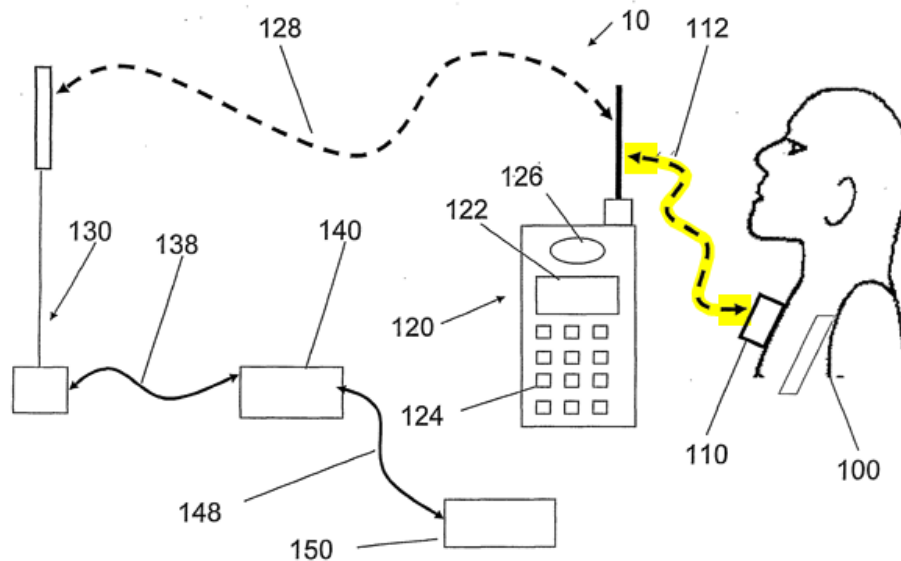
Regarding *wirelessly transferring* the *sleep data*, Ciulla's main module 44 includes "a radio frequency transmitter and receiver for wireless communication." EX1007, [0102], [0106] (internal antenna 92 "enabling the main module 44 to communicate wirelessly"), FIGs. 1A-1B, 8. Ciulla's device (which a POSITA would have understood to be the main module 44) "transmit[s] the multiple sensors' outputs wirelessly (RF, BlueTooth...or other)." EX1007, [0213]; *see also id.*, [0219], [0221], [0230] ("transmitting data [that the system] obtains at any distance...wirelessly"). A POSITA would have thus understood that Ciulla's main module 44 *wirelessly transfer[s] sleep data* corresponding to the multiple sensors' outputs. EX1007, [0102], [0106], [0123], [0126], [0128], [0213], [0219], [0221], [0230]; Kirkness, ¶138; *see* Section VII.C.1; Chatterjee, ¶113.

To the extent Ciulla does not explicitly disclose *wirelessly transferring sleep data* or *a portable, wearable patient interface box*, this would have been obvious in view of Orbach. Kirkness, ¶139; Chatterjee, ¶116.

**b. Orbach**

Orbach's sensor module 110, similar to Ciulla's main module 44 (Sections VII.A-B, VII.C.3), transmits sensor data wirelessly over a "Bluetooth" communication link 112 to a cell phone (*wirelessly transferring*). EX1008, 13:14-27 (link 112 is "Bluetooth"), 15:9-15 (link is for "blue-tooth" bidirectional wireless communication), 16:9-20 (transmitted data is "information indicative of the user's

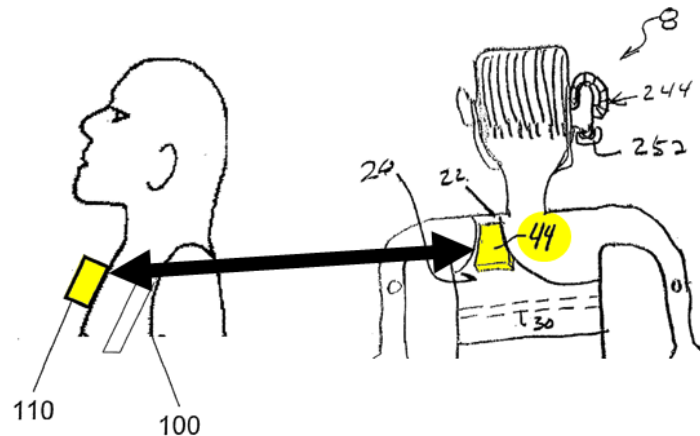
physiological state”), 22:20-27, 41:13-15, FIG. 1; Kirkness, ¶140; Section VII.C.2; Chatterjee, ¶117.



EX1008, FIG. 1 (wireless communication between cell phone 120 and sensor module 110); Kirkness, ¶140. The data is *sleep data* because it is used to “help identify and possibly correct sleep disorders.” EX1008, 41:25-27, FIG. 1.

Like Ciulla’s main module 44, Orbach’s sensor module 110 is *a portable, wearable patient interface box*. Kirkness, ¶141; Chatterjee, ¶118. A user wears 110 as a *single device* as depicted in Figures 1 and 2 and described on a part of the body (*wearable*), and it includes a battery 360 such that measurements can be taken at various locations (*portable*). EX1008, FIGs. 1-3, 13:14-16:20. The module 110 couples to various “sensors” to “measur[e]” physiological signals as a *patient interface* that are wirelessly transmitted (*measuring and then wirelessly transferring*). EX1008, FIGs. 1-3, 13:14-16:20, 13:14-27, 15:9-15, 16:9-20, 22:20-

27, 41:13-15; Kirkness, ¶141. Orbach further discloses that sensor module 110 **box** includes indicator 380 “provid[ing] visual or audio indication” to the monitored patient (*patient interface*). EX1008, 15:4-8.



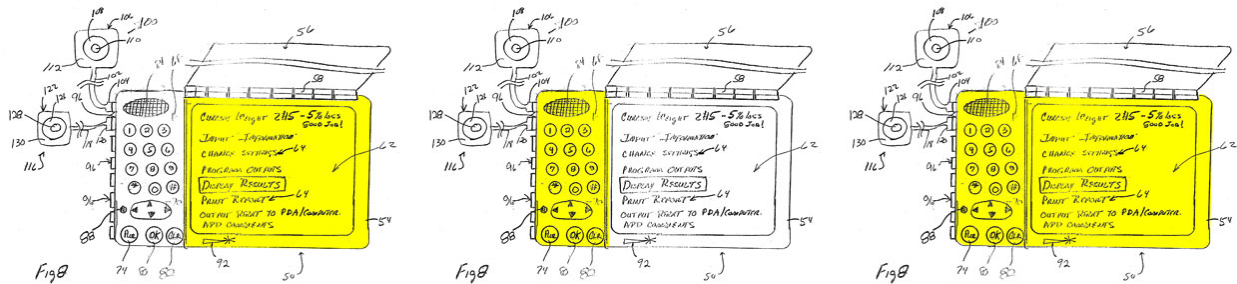
EX1008, FIG. 1 (annotated and excerpted) (left); EX1007, FIG. 1B (annotated and excerpted) (right); Kirkness, ¶141.

Ciulla's **box** (as modified by Orbach) further comprises limitations 1.b.i-1.b.iv as explained below. Kirkness, ¶142.

#### 4. [1.b.i]: *Rigid Enclosure*

Ciulla discloses this limitation. Kirkness, ¶¶143-144; Chatterjee, ¶¶119-120. FIG. 8 (below) depicts Ciulla's main module 44 comprises a base portion 54 having an LCD screen 62 on its right side, and on its left side, an input device 66 that includes buttons. EX1007, [0101], [0103]-[0104], FIG. 8. Either side of the main module 44 (**box**), or both sides together, include an **enclosure**, such as “case 50,”

that houses electronic circuitry of the main module 44. EX1007, [0101], [0103]-[0104], FIG. 8; Kirkness, ¶143.



POSITA would have understood, a lack of rigidity for the screen, keypad, or hinge would reduce the performance of each. EX1007, [0101], [0103]-[0104], FIG. 8; Kirkness, ¶144.

5. [1.b.ii]: *Battery*

Ciulla alone or in view of Orbach discloses this limitation. Kirkness, ¶¶145-146; Chatterjee, ¶¶121-122. Ciulla's "batteries" power main module 44. EX1007, [0101]-[0102], FIGs. 1, 8; Kirkness, ¶145. Ciulla's **box** includes the **batteries** that allow the main module 44 to operate, consistent with Figures 1B and 8. EX1007, [0101]-[0102], FIGs. 1B, 8; Kirkness, ¶145.

To the extent Ciulla does not explicitly disclose a **battery** within the **box**, a POSITA would have understood that Ciulla's **batteries** are an example of "[a]dditional componentry" that are "house[d]" within the case 50. EX1007, [0101]-[0102]. Moreover, Orbach's FIGs. 2-3 depict a battery 360 as part of the "sensor module." EX1008, FIGs. 2-3, 14:4-16:2. Kirkness, ¶146.

Thus, a POSITA would have found it obvious to implement an internal battery within Ciulla's main module 44 and alternatively as taught by Orbach. Kirkness, ¶146. Specifically, an internal **battery** would have avoided disadvantages associated with an externally-connected battery, such as potentially being disconnected due to the user's movement. Kirkness, ¶146. Having an internal **battery** would have therefore improved the main module's wearability, and would have protected the

battery from the user and external environment, like that understood in the art. Kirkness, ¶146. A POSITA would have had a reasonable expectation of success in implementing the configuration at least given how well-known and straightforward it was. Kirkness, ¶146.

6. **[1.b.iii.A]:** *Electrical Component[] Within Box Receiving Electrical Signals From Sensors, Signal Processing Unit Receiving Electrical Signals From Sensors; [1.b.iii.B]: Sensors Attached To Subject And/Or Within Box; [1.b.iii.C]: Sensors Hardwired To Box And/Or Built Within Box; [1.b.iii.D]: Signal Processing Unit Receiving And Processing Sleep Data From Input Channel[]*

Ciulla alone or in combination with the knowledge of a POSITA discloses this limitation. Kirkness, ¶¶147-156; Chatterjee, ¶¶123-133.

For [1.b.iii.A], Ciulla discloses *one or more electrical components within* the main module 44 (*box*, see Section VII.C.3) *for receiving electrical signals from* various sensors (*the at least two sensors*, see Section VII.C.3), *the one or more electrical components include a signal processing unit for receiving the electrical signals from the sensors*. Kirkness, ¶148; Chatterjee, ¶¶124. Specifically, Ciulla's main module 44 "houses electronic circuitry." EX1007, [0101]; *see also id.* EX1007, [0100]-[0102], [0121], [0126]. A "microprocessor" (*one or more electrical components includ[ing] a signal processing unit*) within main module 44 *receiv[es] electrical signals from the [at least two] sensors* because it "receiv[es] a wide variety of inputs from various sensors." EX1007, [0126], *see also id.*, [0101],

[0120]-[0121], [0123] (the main module’s microprocessor “process[es] the information sensed by the sensor...”), [0202], FIGs. 1B, 8; Chatterjee, ¶125.

The microprocessor (also referred to as a CPU or processor) is an *electrical component* and includes *a signal processing unit* at least because it “*process[es]* the information sensed by [a] sensor,” which a POSITA would have understood to include *signals*. EX1007, [0123]; *see also id.*, [0060], [0116], [0125]-[0128], [0142], [0172], [0202]; Kirkness, ¶149; Chatterjee, ¶126.

For [1.b.iii.B], Ciulla discloses *the at least two sensors which are attached to the subject and/or within the portable, wearable patient interface box that is secured to the subject*. Kirkness, ¶150.<sup>13</sup> Ciulla discloses both configurations. *Id.*, ¶151; Chatterjee, ¶¶127, 130.

Ciulla’s sensors (*at least two sensors*) are *attached to the subject*. *Id.* For example, an oximeter is attached to an “earlobe” or “finger.” EX1007, [0118],

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<sup>13</sup> Petitioner notes the disjunctive “or” included in this claim limitation, which specifies the claim limitation is met if either condition is met: A) *attached to the subject* or B) *within the portable, wearable patient interface box*. Kirkness, ¶150 n.4; *e.g.*, *Cochlear Bone Anchored Sols. AB v. Oticon Med. AB*, 958 F.3d 1348, 1359 (Fed. Cir. 2020); *Bracco Diagnostics Inc. v. Maia Pharmaceuticals, Inc.*, 839 Fed. App’x 479, 489 (Fed. Cir. 2020).

[0202], FIG. 1B; Chatterjee, ¶118. A snore sensor 36 is “secured on the chest.” *Id.*, [0143]. An attitude sensor is placed “over the scapular.” *Id.* A breathing sensor 32 is attached to the chest of the subject by a shoulder strap. *Id.*, [0098]-[0099], FIG. 1A; *see also id.*, FIGs. 1A-1B, [0098]-[0099], [0118]-[0119], [0144] (describing other sensors *attached to* the subject); Chatterjee, ¶129.

For *within...the box*, Ciulla also discloses that the attitude sensor or other sensors (*e.g.*, breath sounds monitor, snore monitor, heart rate monitor, and/or chest expansion module) are “designed to be incorporated within the main back module.” *Id.*, [0124], [0143]. Therefore, such a sensor is *within* the main module 44 (*box*). *Id.*, [0101], [0124], [0126], [0142], FIGs. 1B, 8. As explained for [1.b], the *box* is *secured to the subject* because it is attached to the patient’s shoulder area. *Id.*, [0095]-[0098], FIG. 1B; Kirkness, ¶151.

For [1.b.iii.C], Ciulla discloses *the at least two sensors further which are hardwired to connect through at least one connector of the portable, wearable patient interface box and/or are built within the portable, wearable patient interface box*. Kirkness, ¶152.<sup>14</sup> Ciulla discloses both configurations. *Id.*; Chatterjee, ¶131.

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<sup>14</sup> *See supra* n.13.

For ***built within the... box***, Ciulla also discloses that the attitude sensor <sup>15</sup> or other sensors are “incorporated within the main back module” or placed “over the scapular.” EX1007, [0124], [0143]; *see also id.*, [0143]. For ***hardwired***, Ciulla discloses “hard wir[ing]” various sensors (such as breathing sensor 32 and snore sensor 36) through “jacks” or “ports” 96 (***connector***) of main module 44 (***box***). EX1007, [0100], [0106], [0145], FIGS. 1A-1B, 8. Kirkness, ¶153. To the extent Ciulla does not explicitly disclose hardwiring the fingertip-based pulse oximeter or nasal cannula-type sensor 264 to ***connect through at least one connector of the...box***, it would have been obvious to use standard wired sensors, hardwired to the main module 44 ***through a connector*** (*e.g.*, a jack or port on the ***box***). Kirkness, ¶154; *see also infra*, VII.C.8. Ciulla’s sleep device is “constructed using off-the-shelf sensor inputs,” and use of such “standard” sensors “reduce[d] production costs” and was beneficial “for miniaturization and convenience.” EX1007, [0204], [0072], [0226]. Moreover, wired fingertip pulse oximeters and nasal cannula/pressure sensors were standard and ubiquitous prior to 2006. *See, e.g.*, EX1019, FIG. 1,

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<sup>15</sup> A POSITA would have understood that Ciulla’s reference to “attitude indicator,” “attitude monitor,” and “attitude sensor” are interchangeable. EX1007, [0121], [0139], [0143]; Kirkness, ¶153 n.6. This Petition refers to any of these as an attitude sensor.

[0035]; EX1020, [0024], [0040], FIG. 1; EX1021, 11:16-38, 12:53-56, FIGs. 7, 10; EX1022, [0086]; EX1023, 7:5-9, FIG. 2); EX1024, 1:9-19, FIG. 1, 2:65-3:3; EX1025, [0092], [0106] (all describing wired sensors connected via cables); Kirkness, ¶154.

For [1.b.iii.D], Ciulla discloses *the signal processing unit configured for receiving and processing the sleep data from one or more input channels*. Kirkness, ¶155; Chatterjee, ¶¶132-133. The main module 44 processor (*signal processing unit*) *receives* the sensor data (*sleep data*) from the various sensors of Ciulla's sleep device 10 because it "receiv[es] a wide variety of inputs from various sensors." EX1007, [0126]; *see also id.*, [0060] ("a processor for receiving sensor inputs"), [0101], [0121] (sensors transmit information into the main back module), [0127]-[0128], [0142], [0172], [0202].

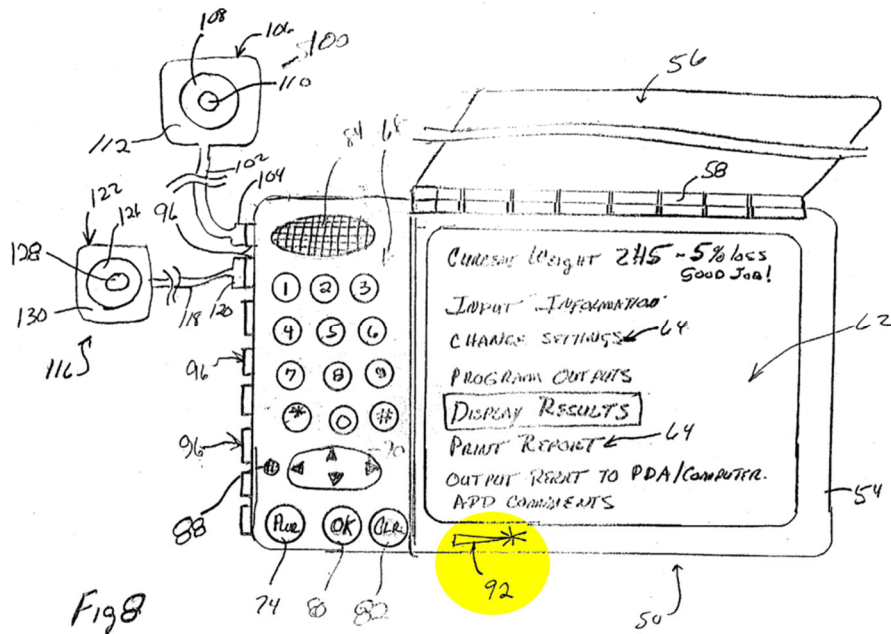
Moreover, Ciulla's processor (*signal processing unit*) within the main back module is "for processing the information sensed by the sensor" (*id.*, [0123]) and "process[es] the received sensor inputs (*id.*, [0060]). This information corresponds to the patient's *sleep data* because it is sensor data measured during sleep, and is input *from input channels such as* an input jack, "two channel EEG leads," or another *input channel* for sensed oximeter or attitude data. EX1007, [0101], [0118], [0121], [0123], [0124], [0126], [0128], [0143], [0202], [0230]; Kirkness, ¶156. Thus, as a POSITA would have readily understood, the processor of the main

module 44 *receives* and *processes* sensor inputs *from* various communication channels, including *one or more input channels*. *Id.*, FIG. 8, [0106], [0124], [0143], [0202], [0219], [0230]; Kirkness, ¶156; Chatterjee, ¶¶132-133.

7. [1.b.iv.A]: *Second Wireless Transceiver Or Transmitter Operat[es] Above 2 GHz*; [1.b.iv.B]: *Transmit[s] Sleep Data Collected With The Box Wirelessly To First Wireless Transceiver Of Cell Phone Or PDA With First Software Loaded*

Ciulla in view of Orbach discloses this limitation. Kirkness, ¶¶157-160; Chatterjee, ¶¶134-138.

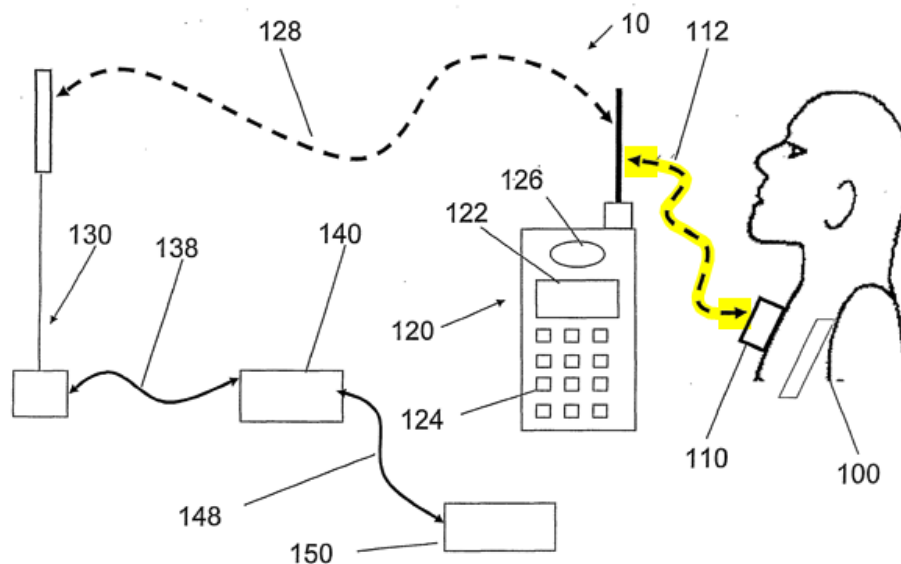
For [1.b.iv.A], main module 44 (*box*, see Section VII.C.3) includes antenna 92 and associated hardware (*second wireless transceiver or transmitter*) that “enabl[es] the main module 44 to communicate wirelessly.” EX1007, [0106], FIG. 8; see also *id.*, [0100] (main module 44 has “wireless communication”), [0125] (“wireless transmitter/receiver within the main back module...transfer[s] data”); Kirkness, ¶158; Chatterjee, ¶135. The main module 44 uses its *wireless transceiver or transmitter* to transmit information over “Bluetooth.” EX1007, [0144]; Kirkness, ¶158; Section VII.A-B, VII.C.2-3.



EX1007, FIG. 8 (annotated to highlight antenna 92); Kirkness, ¶158. As understood in 2006, Bluetooth operates around 2.4 GHz, meaning that Ciulla’s *second wireless transceiver or transmitter is adapted for operating at frequencies above 2 GHz*. Kirkness, ¶158 (detailing Bluetooth communication frequency band); *see generally* EX1017, 18 (Bluetooth “operat[es] in the 2.4 GHz ISM band.”); Chatterjee, ¶136.

For [1.b.iv.B], and as explained for [1.b], the main module 44’s *second wireless transceiver or transmitter* wirelessly transfers (*transmits...wirelessly*) the *sleep data*. *See* Section VII.C.3; EX1007, [0100], [0106], [0125], [0144]; Kirkness, ¶159. As explained for [1.b.iii], the *box*’s processor receives the *sleep data*, which means the *sleep data is collected with the...box*. *See* Section VII.C.6; Kirkness, ¶159; Chatterjee, ¶¶137-138.

When combined with Orbach, Ciulla's main module 44 wirelessly transfers and therefore *transmits* the sensor data (*sleep data*) to Orbach's communication means (*the at least one first wireless transceiver of the cell phone with the first software loaded*). See Sections VII.A-B, VII.C.2-3; Kirkness, ¶160; Chatterjee, ¶¶137-138; EX1007, [0102], [0106], [0123], [0126], [0128], [0213], [0219], [0221], [0230]; EX1008, 13:14-27, 15:9-15, 16:9-20 ("sensor module transmits information indicative of the user's physiological state to the mobile monitor"), 22:20-27, 41:13-15.



EX1008, FIG. 1 (annotated); Kirkness, ¶160.

8. [1.c]: Two Sensors Selected From Group: Accelerometer(s), Pulse oximeter(s) Including Fingertip Pulse Oximeter(s) And Built Into Box, RIP Belt(s), Respiratory Effort Belt(s), Pressure Sensor(s), Microphone(s), Strain Gauge(s), Pressure

*Transducer(s), and Transducer(s)*

Ciulla alone or in view of Orbach discloses this limitation. Kirkness, ¶¶161-163; Chatterjee, ¶¶139-142. The *at least two sensors* correspond to any two of the first, second, third, fourth, and additional sensors, described below. Kirkness, ¶161; Chatterjee, ¶140.

Ciulla’s “oximeter” (first *sensor*) is attached to a “finger” (including the tip of a finger as was conventional for such sensors) “for sensing the oxygen saturation of the user’s blood,” which is consistent with the ’512 Patent’s description of a pulse oximeter (EX1001, 9:59-62) and is therefore a *pulse oximeter including fingertip pulse oximeter*.<sup>16</sup> Kirkness, ¶161; EX1007, [0118], [0202], FIG. 1B; Kirkness, ¶161 (citing EX1033, [0006] (pulse oximeters “typically” measure blood oxygen saturation and sometimes heart rate); EX1034, 1:11-21 as support for a POSITA’s understanding of pulse oximeters).

Ciulla’s attitude sensor (second *sensor*) is a “*transducer*.” EX1007, [0121], [0124], [0143]; Kirkness, ¶161; *see also* EX1030, 5:46-49; EX1031, 11:20-22;

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<sup>16</sup> To the extent the Board determines that a “pulse oximeter” must determine heart rate as well as blood oxygenation, this would have been obvious in view of Orbach’s determination of heart rate as explained for [1.c.ii]. *See* Kirkness, ¶162; Section VII.C.10.b.

EX1032, 11:56-57 (all describing attitude sensors as transducers). A POSITA would have also understood to implement Ciulla's attitude sensor as an *accelerometer*, especially when considering how well-understood accelerometer-based position sensors were for patient monitoring by 2006. Kirkness, ¶161 (citing EX1039, 15:63-16:4; EX1035, 2:18-21; EX1045, [0248]; EX1036, [0035]; EX1037, [0005]; EX1038, Title (all describing accelerometers for sensing body position); Chatterjee, ¶141.

Ciulla's snore sensor 36, breathing sensor 32, nasal cannula-type sensor 264, "heart rate" monitor, and chest expansion sensor 30 (any of which are third, fourth, or additional *sensors*) are implemented as microphones, pressure devices, and/or piezo-electric devices ("*pressure sensor(s)*, *microphone(s)*," "*pressure transducer(s)*," and/or "*transducer(s)*"). EX1007, [0098]-[0099], [0119], [0121], [0124], [0139], [0143], [0202]; Kirkness, ¶161; *see also* EX1014, [0034]; EX1015, 7:66-67; EX1016, Abstract; EX1018, 4:12-13 (all describing microphones as pressure transducers or pressure sensors); Chatterjee, ¶142.

Ciulla's sensors are *adapted* to perform 1.c.i-1.c.iii as explained below. Kirkness, ¶163.

9. [1.c.i.A]: *Sensors Applied To Subject*; [1.c.i.B]: *When Sensors Built Into Box, Applied to Finger, Arm And/Or Torso*

Ciulla discloses this limitation. Kirkness, ¶¶164-165; Chatterjee, ¶¶143-147.

For [1.c.i.A], Ciulla's sensors are *applied to the subject*. For example, nasal cannula-type sensor 264 is secured to the head, mouth, and/or nose (*applied to the subject*). EX1007, [0119], FIG. 1A; Kirkness, ¶164; Chatterjee, ¶144. Other sensors are also *applied to the subject*, including the *pulse oximeter, accelerometer, microphones, pressure sensors, pressure transducers, and transducers*, as explained for [1.c], and further explained below. Chatterjee, ¶145.

For [1.c.i.B], the claim language is conditional (“*when*”) and is not required when none of the sensors are *built into the...box*. Kirkness, ¶165; see Section VII.C.6. Nonetheless, several sensors in Ciulla are both *applied to the subject* and *adapted to be applied to a finger, arm and/or torso of the subject* when built into the box. Chatterjee, ¶¶145-147. For instance, snore and breathing monitors are “incorporated within the main back module” and are *applied to the subject* and *adapted to be applied to* the back, which is part of the *torso*. EX1007, [0124], FIG. 8; Kirkness, ¶165. The attitude sensor similarly is *built into the...box* because it is “designed to be incorporated within the main back module,” and is also *applied to the subject* and *adapted to be applied to* the *torso*. EX1007, [0124], [0143], FIG. 8, [0095]-[0098], [0143] (placing attitude sensor “over the scapular”), see also *id.* [0100], [0145], [0205]; Kirkness, ¶165. Therefore, in Ciulla, *when* a sensor is *built into the...box*, it is *adapted to be applied to a torso of the subject*. Kirkness, ¶165. Because the *box* is mounted to the user's scapular, any sensors that are *built into*

*the...box* are also *adapted to be applied to a torso of the subject*. EX1007, [0100], [0124], [0143], [0145], [0205], FIG. 8; Kirkness, ¶165.

10. **[1.c.ii]: Sensors Measure Or Derive Respiratory Ventilation Directly Or Indirectly, Blood Oxygenation, And Body Position During Testing**

Ciulla alone or in view of Orbach discloses this limitation. Kirkness, ¶¶166-174; Chatterjee, ¶¶148-155. Ciulla's *sensors* make measurements or derivations *of the subject during testing* of the subject or device for the following reasons. Kirkness, ¶166.

**a. Respiratory Ventilation (Direct)**

For *measur[ing] or deriv[ing] respiratory ventilation directly during testing*, the breathing sensor 32, snore sensor 36, and nasal cannula-type sensor 264 *directly* measure the subject's snore and breathing parameters. *See* Sections VII.D.1-2 (dependent claims 2 and 3 stating snore is a type of *respiratory ventilation*); Kirkness, ¶167; Chatterjee, ¶149; EX1007, [0098]-[0099], [0119], [0121], [0124], [0139], [0143], [0202]. Specifically, breathing sensor 32 senses breathing sounds from the chest, and snoring sensor 36 senses snoring and breathing sounds from the nose or mouth. EX1007, [0099]. Nasal cannula-type sensor 264 senses "breath

sounds and/or pressure” from nose or mouth of the subject.<sup>17</sup> EX1007, [0119]. These teachings are consistent with PO’s claim construction position advanced in litigation, as each of these is a *direct* measurement or derivation of respiratory ventilation because snoring and breathing sounds and pressure relate to the process of “respiratory breathing.” See EX1070, 20-22; Kirkness, ¶167.

**b. Respiratory Ventilation (Indirect)**

It would have been obvious for Ciulla’s oximeter to *measure or derive respiratory ventilation indirectly during testing* in light of Orbach’s pulse oximeter teachings. Kirkness, ¶168; Chatterjee, ¶149. Ciulla discloses a pulse oximeter as explained for [1.c]. Section VII.C.8. Orbach discloses a similar conventional pulse oximeter including “Plethysmograph Electronics 320,” and a light source 322 and detector 328 that determines heart activity from intensity of scattered light. *Id.*, 14:11-16, 17:27-18:15, FIG. 3; Kirkness, ¶168.

Orbach analyzes “optical signals from detector 328” to determine parameters like Heart Rate (HR) and Heart Rate Variability (HRV). EX1008, 14:11-16, 16:29-17:3, 27:27-29, 28:5-17, 28:24-29:2, 29:27-30:4, FIG.3. With HR and HRV, Orbach then calculates “Breathing Depth (BD)” and “Breathing Rate (BR)” (*respiratory*

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<sup>17</sup> A POSITA would have understood that the nasal cannula-type sensor 264 senses the ventilation flow path of the canula for sensing pressure. Kirkness, ¶167 n.7.

*ventilation* data). *Id.*, 8:23-27, 16:29-17:3, 29:27-30:4; Kirkness, ¶169. By calculating BD and BR from the direct pulse oximeter measurements, Orbach *indirectly measure[s] or derive[s] respiratory ventilation during testing*. Kirkness, ¶169.

Separately, the system *indirectly measure[s] or derive[s] respiratory ventilation* information *during testing* by displaying “a bar having a length indicative of the breathing activity,” which varies based on lung volume and is *respiratory ventilation*. EX1008, 32:8-30, 56:8-9; Kirkness, ¶170; Chatterjee, ¶150.

A POSITA would have been motivated to infer such user breathing vitals using a single pulse oximeter (measuring blood oxygenation and heart rate) to increase user comfort over “cumbersome and uncomfortable” conventional breathing monitors and to decrease the number of sensors in Ciulla, allowing for cost savings and increased power efficiency. EX1008, 29:23-26; EX1007, [0119], FIG. 1A; Kirkness, ¶171; *see also* VIII.A-B. A POSITA would have had a reasonable expectation of success in combining the oximeter teachings Ciulla and Orbach, given the similar structures in both references, and that Orbach expressly discloses deriving breathing data from blood data. Kirkness, ¶171.

**c. Blood Oxygenation**

As explained for [1.c] (Section VII.C.8), Ciulla's oximeter senses blood oxygen saturation *during testing*, which is *blood oxygenation*. EX1007, [0118], [0202], FIG. 1B; Kirkness, ¶172; Chatterjee, ¶152.

**d. Body Position**

Ciulla's attitude sensor "determin[es] the patient's sleeping position *during testing* (e.g. on back, on side, etc.)," which is *measur[ing] or deriv[ing]...body position*). EX1007, [0143]; Kirkness, ¶173; Chatterjee, ¶153.

**e. During Testing**

In Ciulla, and as explained above, these measurements are performed *during testing* because the sensors are applied during sleep monitoring or analysis, and during "tests conducted." EX1007, [0150], *see also* [0128], [0143], [0230]; Kirkness, ¶174; Chatterjee, ¶154. To the extent *during testing* is not met by Ciulla alone, a POSITA would have known to *test[]* the data acquisition system, especially in view of Orbach's disclosure of using the distributed sleep disorder diagnosis system "in the practice or *testing* of the present invention," which are a part of the Ciulla-Orbach combination. Kirkness, ¶174; EX1008, 11:8-10, 41:25-27, FIG. 1; VII.A-B; Chatterjee, ¶155.

11. **[1.c.iii]: Sensors Releasably Connected And/Or Hardwired Or**

*Within The Box*

As explained for [1.b.iii], Ciulla's *sensors* are ***hardwired to*** and/or<sup>18</sup> ***within the... box***. See Section VII.C.6; Kirkness, ¶175; Chatterjee, ¶157. A POSITA would have understood that the hardwired configuration comprises ***electrical[]*** connections, and Ciulla discloses that sensors (e.g., the breathing sensor, etc.) are ***releasably connected*** via connectable input "jacks" or "ports." Kirkness, ¶175; Chatterjee, ¶157; EX1007, [0100], [0106], [0112], [0145], FIGS. 1A-1B, 8. Moreover, as explained for [1.b], Ciulla's *subject* wears main module 44 on his/her back, which means the *box* is ***adapted to be worn by the subject***. EX1007, [0100], FIG. 8; see Section VII.C.3; Chatterjee, ¶157.

12. [1.d]: *Second Software At Site Remote To First Location*

Ciulla in view of Orbach discloses this limitation. Kirkness, ¶¶176-178; Chatterjee, ¶158-161. Orbach's cell phone forwards sensor data to a "remote server" 140 connected to a viewing station 150. EX1008, 3:19-23, 5:3-5, 8:11-15, 13:21-14:2, 22:20-27, 33:27-34:2. The remote server with a viewing station (either being the *computer*) has a "second processor" (***second processor***) that "provide[s] additional processing" of received "sensor[]" data." EX1008, 3:19-23, 22:28-23:4.

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<sup>18</sup> See *supra* n.13.

A POSITA would have found it obvious for Orbach's server to include *second software stored on a non-transitory computer readable medium and executable by* the remote server, viewing station, or corresponding processor, as these components are programmed to process sensor data and output data. EX1008, 38:19-22, 41:8-24; Kirkness, ¶177; Chatterjee, ¶161. Indeed, as explained in Section VII.A.3, such software was standard, fundamental, and well-known to operate as described. Kirkness, ¶177.

Orbach's remote sensor, viewing station, and second processor (*computer or second processor*) are *at one or more sites remote to the first location*. Kirkness, ¶178; Chatterjee, ¶160. For instance, Orbach's server is "remote," which is at a *site remote to the first location*, where the user is located. EX1008, 3:19-23, 5:3-5, 8:11-15, 13:21-14:2, 22:20-27, 33:27-34:2. The user at *the first location* sends data to the remote server using a "cellular RF link," allowing a practitioner to process and interpret the sensor data and "transmit recommendations to the user." EX1008, 3:19-23, 5:3-5, 8:11-15, 13:21-14:2, 22:20-27, 33:27-34:2.

13. [1.e]: *First Software Wirelessly Receive[s] And Re-Transmit[s] Sleep Data, Or Optionally Send[s] Sleep Data Further Processed With First Processor, With First Wireless Transceiver Over Cell Towers To Computer Or Second Processor For Analysis*

Ciulla in view of Orbach discloses this limitation. Kirkness, ¶¶179-182; Chatterjee, ¶¶162-169. As explained for 1.b, it would have been obvious to modify

Ciulla (EX1007, FIGs. 1A-1B, 8) to transmit sensor data via a cell phone to a practitioner at a remote computer for sleep disorder diagnosis. *See* Sections VII.A-B, VII.C.3; Chatterjee, ¶163.

As explained for [1.a], Orbach's application and programs (*first software*) is *executed by* a cell phone processor (*first processor of the cell phone*). *See* Section VII.C.2. The programs include those "necessary for interfacing with the sensor module" (EX1008, 22:4-13), which means the *first software* is *configured to wirelessly receive...the sleep data* from the sensors. *See* Section VII.C.2; Chatterjee, ¶164. For *wirelessly re-transmit[ting]*, Orbach's *software* also causes the cell phone to "transmit[]" the same sensor data (*re-transmit*) to the remote server, viewing station, or processor (*the computer or the second processor*). EX1008, 13:21-27 (communication link 128 connecting the cell phone to the remote server for in-depth analysis of the sensor data, and optional data transmission to an expert), 16:8-12, 22:4-13, 22:20-23:4 (sensor data processing at remote server), 41:25-27, FIG. 1; *See* Sections VII.C.2-3, VII.C.6-7; Chatterjee, ¶165. Orbach also discloses that *optionally*, the *cell phone processor send[s] the sleep data further processed*, by stating the sensed data is be "analy[zed]," "compressed," used to calculate user vitals, or processed as an alert sent to the server. EX1008, 7:12-16, 22:4-9, 33:24-34:2, 38:23-39:16, 41:11-13 (cell phone has "[d]ata compression, large memory capacity"); Chatterjee, ¶166. Thus, the *cell phone processor* performs *further*

*process[ing]* on the *sleep data* before *send[ing]* it to the *computer or second processor*. Kirkness, ¶180.

Orbach further discloses that the sleep data is re-transmitted or sent *with the at least one first wireless transceiver over cell towers to the computer or the second processor for analysis*. Kirkness, ¶181; Chatterjee, ¶167. As explained for [1.a], Orbach’s phone uses its communication means (*first wireless transceiver*) to “communicate with...remote server.” See Section VII.C.2. In Orbach, this communication occurs over a “cellular RF link to a cellular base station 130” in a corresponding “cellular network,” which a POSITA would have understood to include communication over *cell towers to the* remote server, viewing station, and processor (*computer or second processor*). EX1008, 5:3-5, 13:21-14:2, 22:20-27, 33:27-34:2 (“GSM, GPRS or 3G”); Kirkness, ¶181; Chatterjee, ¶168; e.g., EX1041, [0007]; EX1012, [0004]; EX1013, [0011] (all describing cellular phones as using cellular towers). To the extent not explicitly disclosed, such communications over cell towers would have been obvious for the Ciulla-Orbach system to operate in accordance with standard cellular networks to increase usability and reach, and to obtain the benefit of sending data to the remote server from multiple locations over an existing network of cell towers. Kirkness, ¶181; EX1041, [0007]; EX1012, [0004]; EX1013, [0011].

Finally, regarding *for analysis*, Orbach's remote server, viewing station, and processor (*computer or second processor*) receive the sleep data *for analysis* by an expert or the processor. EX1008, 3:19-4:4 ("analysis"), 5:3-5, 8:11-15, 13:21-14:2 ("in-depth analysis"). Kirkness, ¶182; Chatterjee, ¶169.

14. [1.f]: *Second Software Analyze[s], Output[s], And/Or Format[s] Sleep Data At Remote Site*

Ciulla in view of Orbach discloses this limitation. Kirkness, ¶183; Chatterjee, ¶¶170-174. As explained for [1.d-e], Orbach's remote server with a processor (*computer or the second processor*) executes the *second software* to receive and process *sleep data* (see Section VII.C.12-13) from the sensors (see Sections VII.A-B, VII.C.7, VII.C.13). Such processing includes "analysis" (*analyz[ing]*). EX1008, 3:19-4:4, see also 5:3-5, 8:11-15, 13:21-14:2 (remote server performs "in-depth analysis" of the sensor data), 16:8-12, 22:4-13, 22:20-23:4 (remote servers "provide additional processing of the sensor's data."), 41:25-27, FIG. 1. Moreover, Orbach also *output[s]* the *sleep data* to the "viewing station" or *format[s]* it for an expert to review *at the one or more sites remote from the first location where the sleep data was collected*. EX1008, 3:19-4:4, 5:3-5, 8:11-15, 13:21-14:2, 16:8-12, 22:4-13, 22:20-23:4, 41:25-27, FIG. 1; Kirkness, ¶183.

15. [1.g]: *Second Software Displays Both, In Part, Sleep Data And/Or Analyzed Sleep Data For Diagnosis Of Sleep Disorder,*

*And If Necessary, Provide Basis To Modify Sleep Treatment*

Ciulla in view of Orbach discloses this limitation. Kirkness, ¶184-186; Chatterjee, ¶¶175-179. Orbach's remote server, viewing station, and processor (*computer or the second processor*) *execut[es]* the *second software* (see Sections VII.C.12-13) to *display the sleep data* (see Section VII.C.12-13) on a "viewing station." EX1008, 3:19-4:4, 5:3-5, 8:11-15, 13:21-14:2 (an expert at the viewing station interprets the data and transmits user recommendations), 16:8-12, 22:4-13, 22:20-23:4, 41:25-27, FIG. 1; Chatterjee, ¶¶176-177. As the POSITA would have understood, analyzing the sleep data at the remote site would have means that the viewing station would have also displayed the *analyzed sleep data*, to allow the expert to efficiently interpret the data. Kirkness, ¶184. By viewing the *sleep data and/or analyzed sleep data* on the viewing station, the expert is able to "provide interpretation of the data and transmit recommendations to the use," to thereby "help identify and possibly correct sleep disorders" as needed, where identifying the sleep disorder is *allow[ing] for diagnosis of a sleep disorder*, and possibly correcting the sleep disorder is *if necessary, provid[ing] a basis to modify a sleep treatment of the subject*). EX1008, 2:22-24, 8:11-15, 13:21-14:2, 41:25-27, 44:1-11, FIG. 1; Kirkness, ¶184; Chatterjee, ¶178.

Similarly, Ciulla also discloses *allow[ing] for diagnosis of a sleep disorder*, and possibly correcting the sleep disorder *if necessary, provid[ing] a basis to modify*

*a sleep treatment of the subject.* Chatterjee, ¶¶178-179. Ciulla discloses “[a] clinical trial version [] designed to transmit the multiple sensors’ outputs wirelessly” and “incorporate[s] a wireless receiver allowing the researcher to... observ[e] the patient’s responses...on the receiving computer’s screen.” EX1007, [0213]. A POSITA would have understood that Ciulla’s researcher observes the patient’s responses in order to determine the most effective treatment. Kirkness, ¶185.

Moreover, the device’s microprocessor “directly transmit[s] [analysis] reports...to the therapist’s computer and/or the company’s main frame system for further analysis, research or documentation.” EX1007, [0214]. Again, a POSITA would understand that this analysis would have included adjusting sleep treatment, particularly given Ciulla’s emphasis on diagnosing and treating sleep disordered breathing. Kirkness, ¶186; Chatterjee, ¶179; Ex. 1007, [0021] (“alternative to CPAP”).

**D. Dependent Claims 2-6, 8-17, 19, and 20**

1. **Claim 2:** *Third Sensor Measur[es] Respiratory Ventilation  
Such As Respiratory Effort and/or Snore*

Ciulla discloses this limitation. Kirkness, ¶¶187-190; Chatterjee, ¶¶180-182; *see* Section VII.C (Claim 1). Ciulla’s “nasal cannula-type sensor 264” (*third sensor*) “sens[es] nasal and mouth emitted breath sounds and/or pressure.” EX1007, [0119]; Kirkness, ¶187. By sensing the emitted breath sounds and the flow of air into the

patient's nostrils and/or mouth, the sensor can measure respiratory effort. Kirkness, ¶187. Also, Ciulla's "breathing sensor 32" (also a ***third sensor***) "senses breathing sounds" that helps detect "faulty or obstructed breathing" conditions. EX1007, [0099], [0121], [0124], [0172], FIG. 1A; Kirkness, ¶187. Moreover, Ciulla discloses another "sensor" (also a ***third sensor***) that "receiv[es] information to the amount of chest expansion of a patient." EX1007, Claim 1.

A POSITA would have understood that the nasal cannula-type sensor 264 and breathing sensor 32 are implemented as a microphone and/or a pressure sensor (*see* Section VII.C.8) and connected to main module 44 for processing, and are ***adapted for measuring respiratory ventilation such as respiratory effort and/or snore***, as they "sens[e] nasal and mouth emitted breath sounds and/or pressure." EX1007, [0119], *see also* [0099], [0121], [0124], [0139], [0172], [0202], [0101], [0123], [0126], [0128]; Kirkness, ¶¶188-189; Chatterjee, ¶¶181-182; EX1001, 9:4-5 ("respiratory effort is preferably measured by...pressure"), 3:25-27 (pressure transducers measure airflow, tidal volume, ventilation rate, and snore); EX1014, [0034], EX1015, 7:66-67, EX1016, Abstract, EX1018, 4:12-13 (all describing pressure transducers as including microphones).

Moreover, Ciulla's chest expansion sensor (disclosed in claim 1) also would have ***measur[ed] respiratory ventilation such as respiratory*** because it is used "to measure the expansion of the chest, which provides an indication of the breathing,

(or lack thereof) being performed by the patient.” EX1007, [0098]; Kirkness, ¶190. A POSITA would have appreciated that respiratory effort can be measured in a variety of ways, including by visual observation, chest movement measurement, and more invasive esophageal pressure techniques. Kirkness, ¶190; Chatterjee, ¶¶181-182.

2. **Claim 3:** *Third Sensor Measur[es] Respiratory Effort; Fourth Sensor Measur[es] Snore*

Ciulla discloses this limitation. Kirkness, ¶191; Chatterjee, ¶¶183-185; *see* Section VII.D.1 (Claim 2). The Ciulla-Orbach combination discloses a ***third sensor is adapted for measuring respiratory effort*** as explained for Claim 2. *See* Section VII.D.1. Ciulla’s “snoring sensor 36” (***fourth sensor***) “detect[s] snoring sounds and breathing sounds emitted from the mouth and nose.” EX1007, [0099], FIG. 1A; Kirkness, ¶191. By detecting snoring and breathing sounds, Ciulla’s ***fourth sensor*** is ***adapted for measuring snore***. EX1007, [0099]-[0100], [0123], [0126]; Kirkness, ¶191; EX1001, 3:25-27 (pressure transducers measure snore parameters); *see* Sections VII.C.8, VII.D.1.

3. **Claim 10:** *Sensors Consist Of Pulse Oximeter And Accelerometer*

Ciulla in view of Orbach discloses this limitation. Kirkness, ¶¶204-209; Chatterjee, ¶¶207-208.

a. “Consist Of...”

Claim 10 depends from claim 1, which recites “A...system *comprising*...at least two sensors.” (emphasis added). The use of “comprising” in the preamble of claim 1 means that the claim 10 *system* is not limited to only two sensors. This is consistent with the teachings of the ’512 Patent, which does not disclose any embodiment limited to a pulse oximeter and accelerometer as the only two sensors. Kirkness, ¶205. Thus, the claim 10 *system* may include additional sensors, as long as the sensors include a *pulse oximeter* and *accelerometer* that perform the required sensor functions recited in claim 1.<sup>19</sup> The sensors in the Ciulla-Orbach combination meet this limitation because the *pulse oximeter* and *accelerometer* in the combination meet [1.b] (*used for diagnosing sleep disorders*) and [1.c.ii] (*measure*

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<sup>19</sup> See *In re Crish*, 393 F.3d 1253, 1257 (Fed. Cir. 2004) (interpreting claims containing both “comprising” and “consists” to mean that “the term ‘consists’ limits the ‘said portion’ language to the subsequently recited numbered nucleotides, but the earlier term ‘comprising’ means that the claim can include that portion plus other nucleotides. Read in context, the claims thus do not preclude a DNA sequence having additional nucleotides.”); *In re Gunaji*, Appeal 2022-002519, 5 (PTAB May 15, 2023).

*or derive respiratory ventilation..., blood oxygenation and body position of the subject during testing*).<sup>20</sup>

**b. Pulse Oximeter Used For Diagnos[is], Respiratory Ventilation, and Blood Oxygenation**

As explained for [1.c], the combination's oximeter is a *pulse oximeter*. Section VII.C.8. As explained for [1.c.ii] (for *indirect* determination of *respiratory ventilation*), the combination's oximeter *measure[s] or derive[s] respiratory ventilation indirectly*. Section VII.C.10.b. Also, as explained for [1.c.ii] (for *blood oxygenation*), the combination's oximeter measures *blood oxygenation*. Section VII.C.10.c. Kirkness, ¶206.

For *diagnosing sleep disorders*, the combination's oximeter data is used to *diagnos[e] sleep disorders* because the pulse oximeter data is collected as a part of the SDB diagnosis process explained previously. EX1007, [0118], [0202], [0219], [0230]; Sections VII.C.1, 3, 15; Kirkness, ¶207.

**c. “Accelerometer” Used For Diagnos[is] and Body Position**

As explained for [1.c], a POSITA would have known that Ciulla's attitude sensor is an *accelerometer*. Section VII.C.8. As explained for [1.c.ii] (for *body*

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<sup>20</sup> As explained for [1.c.i] and [1.c.iii], these limitations are met by all sensors in the Ciulla-Orbach combination, and are not re-mapped here.

*position*), Ciulla's attitude sensor *measure[s] or derive[s]...body position*. Section VII.C.10.d. Kirkness, ¶208

For *diagnosing sleep disorders*, the attitude sensor is used to *diagnos[e] sleep disorders* because the body position data is collected as a part of the SDB diagnosis process explained previously. EX1007, [0143], [0219], [0230]; Sections VII.C.1, 3, 15; Kirkness, ¶209.

4. **Claims 4/11/15:** *Transmit Sleep Data to Remote Internet Site or Communication Station Using First Transceiver Over Cell Towers and/or Internet For Analysis*

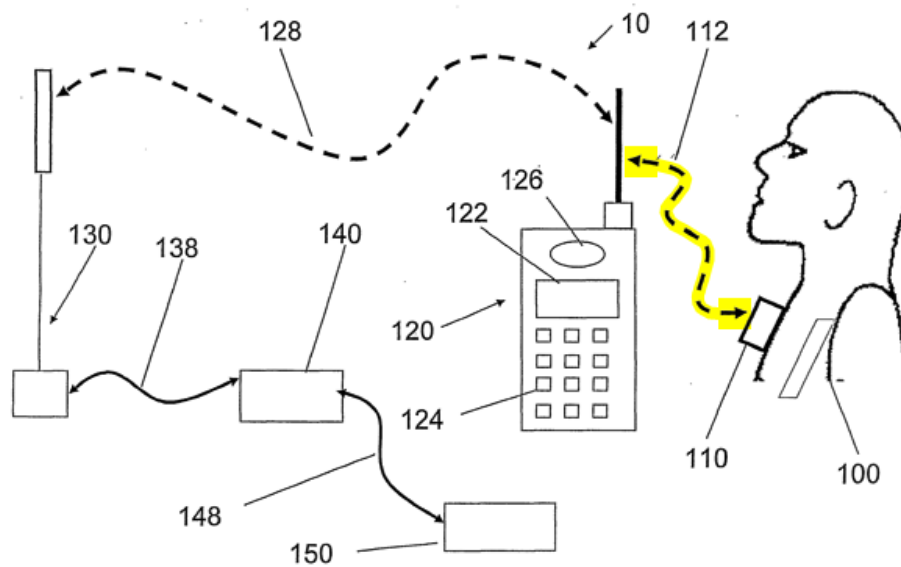
Ciulla in view of Orbach discloses this limitation. Kirkness, ¶¶192-194, 210, 214; Chatterjee, ¶¶186-192; *see* Sections VII.C (Claim 1), VII.D.1 (Claim 2), VII.D.3 (Claim 10). According to the '512 Patent, a *communication station* is any “computer with wireless capabilities,” a device that can “receive RF transmissions,” or a “processor.” EX1001, 15:16-28. Orbach's “remote server” is a *communication station* because it is also a computer or processor with wireless capabilities that receives RF transmissions. Kirkness, ¶¶192-194, 210, 214. For instance, Orbach's remote server connects to a viewing station via a wireless “RF link” for data exchange. EX1008, 13:21-14:2, 52:14-26 (viewing station and remote server exchange data); Kirkness, ¶¶192-194, 210, 214.

Thus, as explained for [1.e], *the sleep data is transmitted* to the *communication station...over cell towers... for analysis*. Kirkness, ¶¶192-194,

210, 214; Chatterjee, ¶192; EX1008, 13:21-14:2 (sensor data sent to remote server for “in-depth analysis.”), 22:20-23:4, FIG. 1; *see* Sections VII.C.12-14.

5.     **Claims 5/12/16: Two-Way Bi-Directional Data Transmission  
Between Two Transceivers**

Ciulla in view of Orbach discloses this limitation. Kirkness, ¶¶195, 211, 215; Chatterjee, ¶¶193-195; *see* Section VII.D.4 (Claims 4/11/15). As explained for [1.a] and [1.b.iv], Orbach’s cell phone’s communication means is a ***first transceiver***, and Ciulla’s antenna 92 and associated hardware on main module 44 is a ***second transceiver***. *See* Sections VII.C.2.a, VII.C.7; Kirkness, ¶¶195, 211, 215. In the combination, as Orbach states, the ***transceivers*** on the wearable device and the cell phone ***utilize[] two-way bi-directional data transmission*** because the cell phone receives sensor data from sensor module 110 (analogous to Ciulla’s main module 44), and also transmits alerts and other data to the sensor module 110 (or Ciulla’s main module 44) over communication link 112. EX1008, 13:14-14:2, 16:13-20 (link 112 is bidirectional), 17:19-26; Sections VII.A-B, VII.C.2.a, VII.C.7; Kirkness, ¶¶195, 211, 215. Orbach’s Figure 1 depicts a ***two-way bi-directional*** arrow, confirming that ***two-way bi-directional data transmission is utilized*** between the transceivers. EX1008, FIG. 1; Kirkness, ¶¶195, 211, 215.



EX1008, FIG. 1 (annotated); Kirkness, ¶¶195, 211, 215.

6. **Claim 6/13/17:** *Remote Control Sleep Data Transmission From First Transceiver and/or First Software When Executed By Cell Phone or PDA*

Ciulla in view of Orbach discloses this limitation. Kirkness, ¶¶196, 212, 216; Chatterjee, ¶¶196-199; *see* Section VII.D.5 (Claims 5/12/16). As explained for [1.a] and claims 4/11/15, Orbach's remote server (*communication station*) interfaces with a cell phone having a *first transceiver* and *first software*. *See* Sections VII.C.2 ([1.a]), VII.D.4 (Claims 4/11/15). In Orbach, the remote server also *can control the sleep data transmission from the first transceiver* by sending "[i]nstructions and commands" "to sensor module 110 through mobile monitor 120." EX1008, 17:19-26, FIG. 1; Kirkness, ¶¶196, 212, 216. These instructions and commands change the "sampling rate" or "sampling accuracy or range" of sensor data, which a POSITA would have understood to include the sampling parameters of the sensor data for

transmission. EX1008, 13:13-14:2, 16:13-20, 17:19-26, 22:20-23:4l. Thus, Orbach's remote server is involved in the *control of the sleep data transmission* from the phone to the server, which a POSITA would have understood is implemented by the *first software* on the phone *when being executed by the cell phone*. EX1008, 16:13-20, 17:19-26, 13:13-14:2, 22:20-23:4; Kirkness, ¶¶196, 212, 216; *see* Sections VII.C.2, VII.C.13.

7. **Claim 8/14/19: Software Filter Determines One Or More Of Airflow, Tidal Volume, Ventilation Rate, and Snore Detection From Sleep Data**

Ciulla in view of Orbach discloses this limitation (Kirkness, ¶¶197-201, 213, 217; Chatterjee, ¶¶200-203; *see* Section VII.D.6 (Claims 6/13/17)) in at least two ways.

First, Ciulla-Orbach extracts breathing parameters from pulse oximeter data, wherein a *software filter is adapted to determine...airflow, tidal volume, and ventilation rate from* heart data in *the sleep data*. Kirkness, ¶198; Chatterjee, ¶¶202-203. According to the '512 Patent, *software filtering* involves extracting different types of sleep data from a sensor. EX1001, 2:31-42, 9:44-51; Kirkness, ¶198. Similarly, and as explained for [1.c.ii], it would have been obvious to use Ciulla-Orbach's pulse oximeter, which measures or derives blood oxygenation, to also infer breathing vitals like Breathing Depth (BD) or Breathing Rate (BR). Section VII.C.10; EX1008, 8:23-27, 16:29-17:3, 29:27-30:4; Kirkness, ¶¶198-199. The

Breathing Depth (BD) corresponds to *tidal volume* because it refers to the amount of air inhaled or exhaled during a breath. Kirkness, ¶¶199. Similarly, the Breathing Rate (BR) corresponds to *airflow* or *ventilation rate* because it refers to the rate at which a person breaths air. Kirkness, ¶199.

As explained for [1.a-b, 1.e], the sensed data is *sleep data* because it is monitored for sleep diagnostic purposes (*from the sleep data*). See EX1008, 41:25-27; Sections VII.C.2-3, 6-7, 13; Kirkness, ¶199. An “application” or “program” (*software filter*) in the cell phone performs breathing analysis, which a POSITA would have known to include *determine[ing]* the *airflow*, *tidal volume*, and *ventilation rate* from the heart sensor data (included in the *sleep data*). EX1008, 13:14-14:2, 22:10-13, 30:10-12 (mobile monitor performs breathing analysis), 29:27-30:9, 32:9-30, 33:24-26, FIG. 1; Kirkness, ¶200.

Second, Ciulla-Orbach’s selective phone display of a “breathing bar” meets this limitation. Kirkness, ¶201. Orbach’s cell phone application software (*software filter*) displays an animation based on the BR, which as explained for the first way above, is calculated from heart data (included in *sleep data*). EX1008, 22:10-13, 33:24-26, 34:3-9, 35:28-36:16; Kirkness, ¶201. Moreover, Orbach’s cell phone application software (*software filter*) calculates the respiration/breathing rate or lung volume (*tidal volume*) to display a “breathing bar.” EX1008, 32:9-30, 33:24-26,

34:3-16; Kirkness, ¶201. The cell phone displays such data to the user based on real-time or stored *sleep data*. EX1008, 35:28-36:16.

8. **Claim 9/20: Box Comprises A/D Converter And Digital Memory For Receiving Sleep Data**

Ciulla discloses this limitation. Kirkness, ¶¶202-203, 218; Chatterjee, ¶¶204-206; *see* Section VII.D.5 (Claims 5/12/16). Ciulla’s main module 44 (*box*) is “constructed using off the shelf components,” including an “analog to digital converter” (*A/D converter*). EX1007, [0204]; Kirkness, ¶¶202-203, 218.

Regarding *digital memory*, Ciulla’s micro-processor of the main module 44 (*box*) is configured for “digitally analyzing and storing data” including the sensor *sleep data*. EX1007, [0073]-[0074], Abstract, [0101], [0123]. The main module 44 comprises a “non-volatile *memory*, such as a smart card” (*id.*, [0102]), which has “*digital* storage” (*id.*, [0230]), serving as a “repository of data collected” (*id.*, [0127]-[0128]) from sensors (*sleep data*). *See also id.*, FIGs. 1A-1B, 8; Kirkness, ¶203; Sections VII.C.2-3, VII.C.13. A POSITA thus would have understood that Ciulla’s *box* has *digital memory for receiving the sleep data* from the sensors. Kirkness, ¶203; Chatterjee, ¶¶205-206.

**VIII. GROUND 2: CIULLA IN VIEW OF ORBACH AND NAGAI  
RENDERS OBVIOUS CLAIMS 1-6, 8-17, 19, AND 20**

**A. Motivation to Combine Ciulla-Orbach with Nagai**

To the extent the Board finds that the Ciulla-Orbach combination does not explicitly disclose (1) *hard-wiring* or *releasably connect[ing]* a pulse oximeter sensor (for [1.b.iii.C] or [1.c.iii]), or (2) a *pulse oximeter* and *accelerometer* (for [1.c] and [10]), these would have been obvious in view of Nagai's explicit teachings. Kirkness, ¶¶64-93, 219-231; Chatterjee, ¶¶24-56, 209-224. Moreover, to the extent the Board interprets the claim 10 system to be limited to only a pulse oximeter and accelerometer, this would have also been obvious in view of Nagai. Kirkness, ¶¶228-231.

First, it would have been obvious to *hardwire* a standard wired pulse oximeter to the main module 44 (*box*) *through* a *connector* (e.g., a jack, port) *of the box* as in Nagai for the same reasons explained for [1.b.iii.C] and [1.c.iii]. *See* Sections VII.C.6, VII.A.2. Kirkness, ¶220; Chatterjee, ¶219.

Second, Nagai's explicit disclosure of a *pulse oximeter* and *accelerometer*-based body position sensor would have motivated a POSITA to implement the Ciulla-Orbach's oximeter as a *pulse oximeter* and the attitude sensor as a conventional *accelerometer*, for the same reasons explained for these sensors in [1.c]. Kirkness, ¶¶221-222; *see* Sections VII.C.3, 8. Ciulla already constructs its

system “using off-the-shelf sensor inputs,” and states that using such “standard” sensors “help[s] reduce production costs.” EX1007, [0204], [0072], [0226]; Kirkness, ¶¶221-222. A POSITA would have been motivated to use standard components including Nagai’s *pulse oximeter* and *accelerometer*, to properly diagnose and treat sleep disorders depending on body position, which is consistent with Ciulla’s purpose of providing treatment based on sleep data. EX1010, [0172]-[0173], [0183]-[0189], [0209], [0211]; Kirkness, ¶¶221-222; Chatterjee, ¶220; *see* Section VII.

Third, to the extent the Board interprets Claim 10 to be limited to no more than two sensors (*pulse oximeter* and *accelerometer*), this would have been obvious from Nagai’s explicit disclosure of a two-sensor sleep evaluation system. Kirkness, ¶223; Chatterjee, ¶221. A POSITA would have appreciated that reducing the sensors in the Ciulla-Orbach combination would have reduced costs and complexity and increased user convenience over more cumbersome sensing systems. Kirkness, ¶223. Limiting the system to only two sensors would have also meant savings in power consumption and computational burden. *Id.*

#### **B. Reasonable Expectation of Success**

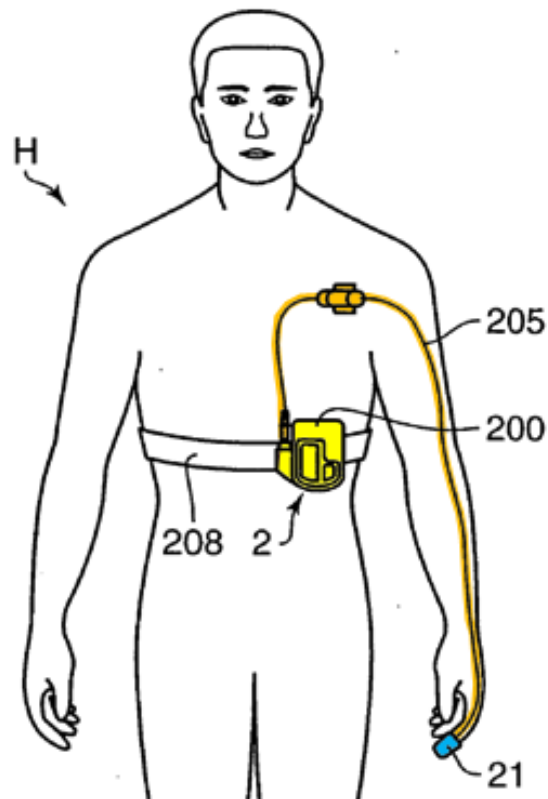
A POSITA would have had a reasonable expectation of success in modifying Ciulla-Orbach with Nagai. Kirkness, ¶¶64-93, 224; Chatterjee, ¶¶222-224. First, Ciulla, Orbach, and Nagai are analogous art, each pertaining to sleep monitoring

systems. Kirkness, ¶224; Section VII; EX1010, [0003], Abstract. Second, the modification would have simply involved an obvious and predictable integration of known hardwired pulse oximeters and accelerometers, and simple two-sensor sleep evaluation systems, using known circuit integration methods with a reasonable expectation of success, due to how well-known the configuration was. *See KSR*, 550 U.S. at 416; Kirkness, ¶224.

### C. Independent Claim 1

This Ground incorporates Ground 1, and adds Nagai’s teachings for *hardwiring* or *releasably connect[ing]* a pulse oximeter for [1.b.iii.C] and [1.c.iii]. Kirkness, ¶225.

Nagai discloses pulse oximeter in a “sleep evaluation system.” EX1010, [0057]-[0060], FIGs. 2-3; Chatterjee, ¶¶212-213. Nagai’s “main body 200” (analogous to Ciulla’s main module 44) attaches to a subject and a pulse oximeter probe 21. *Id.*, [0058], [0060]; Kirkness, ¶226. “The probe 21 has a paper-clip like shape capable of securely holding a finger F of a subject to measure...blood oxygen saturation.” EX1010, [0059]. Nagai’s main body 200 (yellow, below) and oximeter probe 21 (blue, below) are electrically connected by a “probe cable 205” (*hardwired* or *releasably connected*) equipped with a connector 204 (orange, below) that connects to a connecting portion of the main body (such as 206) (*to connect through at least one connector*). EX1010, [0058]-[0060], FIG. 3; Kirkness, ¶226.



EX1010, FIG. 3 (excerpted and annotated); Kirkness, ¶226.

Ciulla in view of Orbach and Nagai discloses the remaining limitations of claim 1 for the same reasons discussed in Ground 1. *See* Section VII.C (Ground 1, Claim 1); Kirkness, ¶227. The addition of Nagai does not change how a POSITA would consider the combination of Ciulla-Orbach in Ground 1. Kirkness, ¶227.

#### D. **Dependent Claim 10**

1. **Claim 10.** *Sensors Consist Of Pulse Oximeter And Accelerometer*

Ciulla-Orbach in view of Nagai discloses this limitation. Kirkness, ¶¶228-231; *see* Section VII (Claim 1).

**a. Only Two Sensors**

To the extent the Board interprets the Claim 10 system to be limited to two sensors (accelerometer and pulse oximeter) (it does not, *supra* VII.D.3.a), this would have been obvious from Nagai's express teaching of a two-sensor system for detecting and treating sleep disorders. Kirkness, ¶229; Chatterjee, ¶¶214-217. Nagai considers pulse oximeter information with body position information (sensed by an accelerometer) to determine a "correlation between apnea and body position of the subject in sleep." EX1010, [0172], [0142]-[0145].

**FIG.21C**

RELATION BETWEEN BODY  
POSITION AND BODY ANGLE

|                                     |                                |
|-------------------------------------|--------------------------------|
| PRONE POSITION                      | -135° TO -180° OR 135° TO 180° |
| RIGHT LATERAL<br>DECUBITUS POSITION | -45° TO -135°                  |
| SUPINE POSITION                     | -45° TO 45°                    |
| LEFT LATERAL<br>DECUBITUS POSITION  | 45° TO 135°                    |

*Id.*, FIG. 21C, [0135]. According to Nagai, the acceleration sensor and pulse oximeter are sufficient for evaluating sleep. *Id.*, [0048]-[0049], [0054]-[0055], [0058], FIGs. 2, 11, claims 2, 7, 9; Kirkness, ¶229.

**b. Pulse Oximeter**

To the extent Ciulla-Orbach do not explicitly disclose a *pulse oximeter*, this would have been obvious in view of Nagai's explicit teachings of a *pulse oximeter* as "measuring the blood oxygenation saturation," which is consistent with the

disclosures in Ciulla and Orbach. Sections VII.C.8, 10; Kirkness, ¶230; Chatterjee, ¶¶212-217.

**c. Accelerometer**

To the extent Ciulla-Orbach do not explicitly disclose an *accelerometer*, it would have been obvious to implement Ciulla’s attitude sensor as Nagai’s “acceleration sensor,” which is an *accelerometer*. Kirkness, ¶231; EX1010, [0049], [0070]-[0071]; Chatterjee, ¶¶212-217. Nagai’s “acceleration sensor” is used as a “body position detector 12,” which “detects a body position of the subject in terms of angle information.” EX1010, [0047], [0049], FIG. 1. Nagai’s “acceleration sensor” is an *accelerometer*, at least because it has a sensor body 220 comprising piezoresistive devices 224. *Id.*, [0049], [0070]-[0071]; Kirkness, ¶231. As Nagai describes, the *accelerometer* provides angle information for detecting the subject’s position (*e.g.*, prone, supine). EX1010, [0081]-[0082], [0135], [0183].

**E. Dependent Claims 2-6, 8-9, 11-17, 19, and 20**

Ciulla-Orbach and Nagai discloses claims 2-6, 8-9, 11-17, and 19-20 for the same reasons discussed in Ground 1. *See* Section VII.D; Kirkness, ¶¶232-237. Adding Nagai does not change how a POSITA would consider the combination of Ciulla-Orbach in Ground 1. Kirkness, ¶¶232-237.

**IX. GROUND 3: CIULLA IN VIEW OF ORBACH AND TRUSCHEL  
RENDERS OBVIOUS CLAIMS 7 AND 18**

**A. Motivation to Combine Ciulla-Orbach with Truschel**

This Ground incorporates Ground 1, and modifies the Ciulla-Orbach system with Truschel's high-frequency and dynamic snore filtering process. Kirkness, ¶¶64-93, 238-244; Chatterjee, ¶¶24-56, 225-235. Ciulla's device includes a snoring sensor 36, and states that filtering would be "appropriate" for detecting snoring. EX1007, [0142] (apply appropriate filtering to snore sensor), [0204] (appropriate filtration for "accurate detection...snore vibrations"). Implementing Truschel's software filtering in Ciulla would have improved Ciulla's snore detection by accounting "age, gender, or health of a patient." EX1011, [0050]; Kirkness, ¶¶238-239. It also would have helped Ciulla avoid "false snore indications" which do not "take into account dynamic background noise" and "other noise." EX1011, [0040], [0051]; Kirkness, ¶¶238-239. Adding dynamic adjustments to snore calculations would have enhanced Ciulla's handling of changes in "background noise and patient noises." EX1011, [0052]-[0054], [0068], FIG. 3; Kirkness, ¶¶238-239.

**B. Reasonable Expectation of Success**

A POSITA would have had a reasonable expectation of success in modifying Ciulla combinations with the teachings of Truschel. Kirkness, ¶¶64-93, 240; Chatterjee, ¶¶233-235. First, Ciulla, Orbach, and Truschel are analogous art. Kirkness, ¶240. Each reference describes sensors and processors for processing sleep data. Kirkness, ¶240; Section VII; EX1010, Abstract, [0005]-[0007], [0041].

Second, the proposed modification would have involved a simple and understood change in a programming algorithm, which was nothing more than a combination of known prior art elements according to known methods and known techniques (programming a processor based on signals from snore sensors and/or user information) to yield predictable results (dynamically filtering snore data). Kirkness, ¶240.

**C. Dependent Claims 7 and 18**

1. **Claim 7/18.** *Software Filter Extracts High Frequency To Obtain Snore Signal*

Ciulla in view of Orbach and Truschel discloses this limitation. *See* Section VII.D.6 (Ground 1, Claim 6/17); Kirkness, ¶¶241-244; Chatterjee, ¶¶225-229.

Truschel discloses dynamic software-based filtering for detecting snoring. Kirkness, ¶¶241. Similar to Ciulla, Truschel uses a “pressure sensor 48 as a microphone” that “convert[s] a snore pressure wave into a proportional analog signal.” EX1011, [0045]. A “snore analysis device 64” and “digital band pass filter 58” are implemented within a controller 50 using “suitable programming” (*software filter*). *Id.*, [0043], [0046] (snore detection program); Kirkness, ¶241. Truschel’s filter (*software filter*) *obtain[s] a snore signal* by “checking for vibrations in pressure signal 72 within a broad range of 40 to 160 Hz” (*extract a high frequency portion of a signal from a sensor[]*). EX1011, [0068], *see also* [0043], [0045]-

[0046], [0050], [0053] (filters to 40-160 Hz “represent[ing] the approximate range of frequencies produced during snoring”); Chatterjee, ¶¶227-229. A POSITA would have understood that filtering to 40-160 Hz meets *extract[ing] a high frequency portion of a signal from a sensor[]*. Kirkness, ¶¶242-243; *see, e.g.*, EX1042, [0058], EX1043, [0044], [0045], EX1044, [0091] (all describing snoring as having high frequency).

**X. GROUND 4: CIULLA IN VIEW OF ORBACH AND KUMAR  
RENDERS OBVIOUS CLAIMS 6, 8, 13-14, 17, AND 19**

**A. Motivation to Combine Ciulla-Orbach with Kumar**

To the extent the Board finds that Ciulla-Orbach does not control sleep data as explained in the Claim 6 analysis for Ground 1, such a configuration would have been obvious in view of Kumar. Kirkness, ¶¶64-93, 245-255; Chatterjee, ¶¶24-56, 236-244. This Ground incorporates Ground 1, and modifies the Ciulla-Orbach system with Kumar’s teachings of a remote practitioner site to control a user sensor and corresponding transmitted data (via a cell phone, PDA, etc. of Ciulla-Orbach) like that claimed. Kirkness, ¶245. Such remote sensing control features would have reduced burden on and confusion of patients when operating at-home sleep equipment by allowing their doctors or a practitioner to directly control the sensing hardware. EX1009, [0080], [0085]; Kirkness, ¶245. It also would have allowed the system to be used for remote troubleshooting to reduce problems when a user uses

such sleep monitoring equipment, thereby improving the user experience and allowing the system to better develop. EX1009, [0258]-[0259]; Kirkness, ¶245.

**B. Reasonable Expectation of Success**

A POSITA would have had a reasonable expectation of success in modifying Ciulla combinations with the teachings of Kumar. Kirkness, ¶¶64-93, 246; Chatterjee, ¶¶242-244. First, Ciulla and Kumar are analogous art, both pertaining to sleep monitoring systems. Kirkness, ¶246; Section VII; EX1009, [0015], [0068], [0239]-[0241], Abstract. Second, such a modification would have been no more than an obvious and predictable integration of known methods for enabling a doctor/practitioner to control user/patient sensing equipment with a reasonable expectation of success. *See KSR*, 550 U.S. at 416; Kirkness, ¶246. Implementing such changes in software described by Kumar with the given Ciulla-Orbach hardware configuration would have been well within the skill and capability of a POSITA before the alleged priority date. EX1009, [0080], [0085], [0191]; Kirkness, ¶246.

**C. Dependent Claims 6, 8, 13-14, 17, and 19**

**1. Claim 6/13/17**

Ciulla in view of Orbach and Kumar discloses this limitation. *See* Section VII.D.5 (Ground 1, Claim 5/12/16); Kirkness, ¶¶247-249, 251, 253; Chatterjee, ¶¶236-238.

Like Ciulla, Kumar’s patient-side device “gathers physiological data from the patient” and generates sensed sleep information (*sleep data*). EX1009, [0071], *see also* [0015], [0068], [0239]-[0241]; Kirkness, ¶247. The sensors have “wireless” (EX1009, [0089]) communication with a stream manager program on a patient-side computing device (e.g., PDA, “wireless telephone”) (*first software when being executed by the cell phone or PDA*) (*id.*, [0071]-[0072]), which has wireless communication hardware (*first transceiver*) (*id.*, [0072]) for communicating with the sensors and a remote medical provider (*id.*, [0080]-[0081], [0085], [0191]). Kirkness, ¶247; Chatterjee, ¶¶236-238.

Kumar’s provider “remotely control[s] the client-side device” “to read the data periodically or whenever needed” (EX1009, [0015]), which means the *remote Internet site or communication station can control the sleep data transmission*. *See also* EX1009, [0080], [0085] (both describing remote control of patient-side software). From Kumar’s teachings, a POSITA would have found it obvious to implement Orbach’s remote server (*communication station*) to also *control the sleep data transmission from the at least first transceiver, and/or the first software when being executed by the cell phone or PDA*. Kirkness, ¶¶248-249; Chatterjee, ¶¶236-238.

**2. Claim 8/14/19**

Ciulla in view of Orbach and Kumar discloses this limitation. *See* Sections X.C.1 (Ground 4, Claim 6/13/17), VII.D.7 (Ground 1, Claim 8/14/19); Kirkness, ¶¶250, 252, 254; Chatterjee, ¶¶236-238.

**XI. GROUND 5: CIULLA IN VIEW OF ORBACH, KUMAR, AND TRUSCHEL RENDERS OBVIOUS CLAIMS 7 AND 18**

This Ground incorporates Ground 3 for the combination of Ciulla, Orbach, and Truschel, and incorporates Ground 4 for adding Kumar's teachings to modify the Ciulla-Orbach-Truschel system in the same manner for claims 7/18. *See* Sections X.C.1 (Ground 4, Claim 6/17), IX.C.1 (Ground 3, Claim 7/18); Kirkness, ¶¶255-257; Chatterjee, ¶¶245-248. The addition of Kumar does not change how a POSITA would consider the combination of Ciulla-Orbach-Truschel. Kirkness, ¶¶255-257; Chatterjee, ¶¶245-248.

**XII. GROUND 6: CIULLA IN VIEW OF ORBACH, NAGAI, AND KUMAR RENDERS OBVIOUS CLAIMS 6, 8, 13, 14, 17, AND 19**

This Ground incorporates Ground 2 for the combination of Ciulla, Orbach, and Nagai, and incorporates Ground 4 for adding Kumar's teachings to modify the Ciulla-Orbach-Nagai system in the same manner for claims 6/17 and 8/19. *See* Sections VIII, X; Kirkness, ¶¶258-260; Chatterjee, ¶¶249-252. Dependent claim 13 is nearly identical to claims 6/17, and dependent claim 14 is nearly identical to claims 8/19, and a POSITA would have found these claims obvious for the same reasons as

explained in Ground 4. Kirkness, ¶¶258-260; Chatterjee, ¶¶249-252. The addition of Kumar does not change how a POSITA would consider the combination of Ciulla-Orbach-Nagai. Kirkness, ¶¶258-260; Chatterjee, ¶¶249-252.

**XIII. GROUND 7: CIULLA IN VIEW OF ORBACH, NAGAI, AND TRUSCHEL RENDERS OBVIOUS CLAIMS 7 AND 18**

This Ground incorporates Ground 2 for the combination of Ciulla, Orbach, and Nagai, and incorporates Ground 3 for adding Truschel's teachings to modify the Ciulla-Orbach-Nagai system in the same manner for claims 7/18. *See* Sections VIII, IX; Kirkness, ¶261; Chatterjee, ¶¶253-255. The addition of Truschel does not change how a POSITA would consider the combination of Ciulla-Orbach-Nagai. Kirkness, ¶261; Chatterjee, ¶¶253-255.

**XIV. GROUND 8: CIULLA IN VIEW OF ORBACH, NAGAI, AND KUMAR, AND TRUSCHEL RENDERS OBVIOUS CLAIMS 7 AND 18**

This Ground incorporates Ground 6 for the combination of Ciulla, Orbach, Nagai, and Kumar, and incorporates Ground 3 for adding Truschel's teachings to modify the Ciulla-Orbach-Nagai-Kumar system in the same manner for claims 7/18. *See* Sections IX, XII; Kirkness, ¶262; Chatterjee, ¶¶256-258. The addition of Truschel does not change how a POSITA would consider the combination of Ciulla-Orbach-Nagai-Kumar. Kirkness, ¶262; Chatterjee, ¶¶256-258.

## **XV. SECONDARY CONSIDERATIONS**

There are no secondary considerations known to Petitioner that affect, let alone overcome—this strong case of obviousness. Should PO proffer any relevant evidence of secondary considerations, Petitioner reserves its rights to address. *Chatterjee*, ¶259; *Kirkness*, ¶2.

## **XVI. THE BOARD SHOULD REACH THE MERITS**

### **A. No Denial Under *Advanced Bionics***

Institution is appropriate under § 325(d) because substantially the same art and arguments have never been presented to or considered by the Office. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 6-11 (Feb. 13, 2020) (precedential). None of Orbach, Truschel, Nagai, or Kumar were considered during prosecution (*see* EX1002), and therefore, these combinations were never before the Office.

Although the Examiner indicated that he considered Ciulla along with over 50 other references (EX1002, 183-188), he did not rely on Ciulla in a rejection. These facts do not weigh in favor of exercising the Board’s discretion under § 325(d). *See, e.g., Amazon.com, Inc. v. M2M Sols. LLC*, IPR2019-01205, Paper 14, 15-16 (PTAB Jan. 27, 2020); *Fasteners for Retail, Inc. v. RTC Indus., Inc.*, IPR2019-00994, Paper 9, 9-10 (PTAB Nov. 5, 2019); *Mylan Pharm. Inc., v. Merck Sharp & Dohme Corp.*, IPR2020-00040, Paper 21, 8, 18 (PTAB May 12, 2020); *Adv. Energy Indus. Inc. v.*

*Reno Tech. Inc.*, IPR2021-01397, Paper 7, 7 (PTAB Feb. 16, 2022) (“[T]he Examiner’s consideration of both references appears limited to initialing an IDS.”).

**B. No Denial Under *Fintiv***

Should PO seek denial under *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (Mar. 11, 2020) (precedential), Petitioner will seek permission to reply to address the facts and law as they stand at the time. Currently, no trial is scheduled, thus *Fintiv* is inapplicable.

**XVII.MANDATORY NOTICES**

**A. Real Parties-in-Interest**

The real party-in-interest is ResMed Corp.

**B. Related Matters**

U.S. Patent Office records indicate that the ’512 Patent is assigned to Cleveland Medical Devices, Inc. (“PO”). PO is currently asserting infringement of the ’512 Patent by Petitioner in the following litigation: *ResMed Corp., v. Cleveland Medical Devices, Inc.*, 1:23-cv-02221-BMB (N.D. Ohio.).

Petitioner filed a petition for *inter partes* review against related U.S. Patent No. 11,602,284, which is asserted in the same litigation. *See* IPR2025-00157. Petitioner will also file petitions for *inter partes* review against U.S. Patent Nos. 11,375,921, 11,786,680, 11,857,333, and 11,872,029, also asserted in the same litigation.

Petitioner has filed requests for *ex parte* reexaminations for U.S. Patent Nos. 11,375,921 (90/019,700) and 11,786,680 (90/019,705).

**C. Notice of Counsel and Service Information**

ResMed provides the following designation of counsel:

|                 |                                                                                                                                                                                                                             |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lead Counsel    | Lisa K. Nguyen (Reg. No. 58,018)<br>Paul Hastings LLP<br>1117 S. California Avenue<br>Palo Alto, CA 94303<br>Telephone: 650.320.1800<br>Fax: 650.320.1900<br>Email: PH-ResMed-CleveMed@paulhastings.com                     |
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|                 |                                                                                                                                                                                                 |
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|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney accompanies this Petition. Petitioner consents to electronic service by e-mail.

**D. Fee for *Inter Partes* Review**

The Director is authorized to charge the fee specified by 37 C.F.R. § 42.15(a) to Deposit Account No. 50-2613.

**E. Grounds for Standing**

Petitioner certifies pursuant to 37 C.F.R. § 42.104(a) that the '512 Patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified in this Petition.

**XVIII. CONCLUSION**

For these reasons, Petitioner respectfully requests institution.

Respectfully submitted,

By: /Lisa K. Nguyen/  
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**RESMED CORP.**

**CLAIM APPENDIX**

1. A sleep diagnostic data acquisition system comprising:

- [1.a] a) a first software stored on a non-transitory computer readable medium and executable by a first processor, the software configured to be loaded on a cell phone or Personal Digital Assistant (“PDA”) comprising at least one first wireless transceiver and the first processor;
- [1.b] b) a portable, wearable patient interface box adapted to be secured to a subject at a first location and providing a single device for measuring and then wirelessly transferring sleep data from at least two sensors used for diagnosing sleep disorders, the portable, wearable patient interface box comprising:
  - [1.b.i] i) an enclosure of a rigid material;
  - [1.b.ii] ii) a battery;
  - [1.b.iii.A] iii) one or more electrical components within the portable, wearable patient interface box for receiving electrical signals from the at least two sensors, the one or more electrical components include a signal processing unit for receiving the electrical signals from the sensors,
  - [1.b.iii.B] the at least two sensors which are attached to the subject and/or within the portable, wearable patient interface box that is secured to the subject,
  - [1.b.iii.C] the at least two sensors further which are hardwired to connect through at least one connector of the portable, wearable patient interface box and/or are built within the portable, wearable patient interface box,

- [1.b.iii.D] the signal processing unit configured for receiving and processing the sleep data from one or more input channels; and
- [1.b.iv.A] iv) a second wireless transceiver or transmitter is adapted for operating at frequencies above 2 GHz and
- [1.b.iv.B] transmitting the sleep data collected with the portable, wearable patient interface box wirelessly to the at least one first wireless transceiver of the cell phone or PDA with the first software loaded;
- [1.c] c) the at least two sensors are selected from a group consisting of: accelerometer(s), pulse oximeter(s) including fingertip pulse oximeter(s) and those built into the portable, wearable patient interface box, RIP belt(s), respiratory effort belt(s), pressure sensor(s), microphone(s), strain gauge(s), pressure transducer(s), and transducer(s), the at least two sensors adapted:
  - [1.c.i.A] i) to be applied to the subject,
  - [1.c.i.B] a first and a second of the at least two sensors of the portable, wearable patient interface box when the one or more of the sensors are built into the portable, wearable patient interface box are adapted to be applied to a finger, arm and/or torso of the subject;
  - [1.c.ii] ii) to measure or derive respiratory ventilation directly or indirectly, blood oxygenation and body position of the subject during testing; and
  - [1.c.iii] iii) to be releasably connected and/or electrically hardwired to or within the portable, wearable patient interface box adapted to be worn by the subject;

- [1.d] d) an at least second software stored on a non-transitory computer readable medium and executable by a computer or a second processor at one or more sites remote to the first location;
  - [1.e] e) the first software, when executed by the first processor of the cell phone or PDA, configured to wirelessly receive and re-transmit the sleep data, or optionally send the sleep data further processed with the first processor of the cell phone or the PDA, with the at least one first wireless transceiver over cell towers to the computer or the second processor for analysis;
  - [1.f] f) the second software when executed by the computer or the second processor configured to analyze, output and/or format the sleep data at the one or more sites remote from the first location where the sleep data was collected; and
  - [1.g] g) the at least second software, when executed by the second processor or the computer, configured to display both, in part, the sleep data and/or analyzed sleep data to allow for diagnosis of a sleep disorder and, if necessary, provide a basis to modify a sleep treatment of the subject.
2. The sleep diagnostic data acquisition system of claim 1, further comprising an at least third sensor wherein the at least third sensor is adapted for measuring respiratory ventilation such as respiratory effort and/or snore.
  3. The sleep diagnostic data acquisition system of claim 2, further comprising an at least fourth sensor wherein the third sensor is adapted for measuring respiratory effort and the fourth sensor is adapted for measuring snore.
  4. The sleep data acquisition system in claim 2, wherein the sleep data is transmitted to a remote Internet site or communication station using the at least one first wireless transceiver to transmit the sleep data over cell towers and/or the Internet for analysis.
  5. The sleep data acquisition system in claim 4, wherein two-way bi-directional data transmission is utilized between the second transceiver and the at least first transceiver.

6. The sleep data acquisition system in claim 5, wherein the remote Internet site or communication station can control the sleep data transmission from the at least first transceiver, and/or the first software when being executed by the cell phone or PDA.
7. The sleep data acquisition system in claim 6, further comprising a software filter configured to extract a high frequency portion of a signal from one of the three sensors to obtain a snore signal.
8. The sleep data acquisition system in claim 6, further comprising a software filter wherein the software filter is adapted to determine one or more of airflow, tidal volume, ventilation rate and snore detection from the sleep data.
9. The sleep data acquisition system in claim 5, wherein the portable, wearable patient interface box further comprises an A/D converter and a digital memory for receiving the sleep data.
10. The sleep data acquisition system in claim 1, wherein the at least two sensors consist of a pulse oximeter and an accelerometer.
11. The sleep data acquisition system in claim 10, wherein the sleep data is transmitted to a remote Internet site or communication station using the at least one first wireless transceiver to transmit the sleep data over cell towers and/or the Internet for analysis.
12. The sleep data acquisition system in claim 11, wherein two-way bi-directional data transmission is utilized between the second transceiver and the at least first transceiver.
13. The sleep data acquisition system in claim 12, wherein the remote Internet site or communication station can control the sleep data transmission from the at least first transceiver, and/or the first software when being executed by the cell phone or PDA.
14. The sleep data acquisition system in claim 13, further comprising a software filter wherein the software filter is adapted to determine one or more of

airflow, tidal volume, ventilation rate and snore detection from the sleep data.

15. The sleep data acquisition system in claim 1, wherein the sleep data is transmitted to a remote Internet site or communication station using the at least one first wireless transceiver to transmit the sleep data over cell towers and/or the Internet for analysis.
16. The sleep data acquisition system in claim 15, wherein two-way bi-directional data transmission is utilized between the second transceiver and the at least first transceiver.
17. The sleep data acquisition system in claim 16, wherein the remote Internet site or communication station can control the sleep data transmission from the at least first transceiver, and/or the first software when being executed by the cell phone or PDA.
18. The sleep data acquisition system in claim 17, further comprising a software filter configured to extract a high frequency portion of a signal from one of the at least two sensors to obtain a snore signal.
19. The sleep data acquisition system in claim 17, further comprising a software filter wherein the software filter is adapted to determine one or more of airflow, tidal volume, ventilation rate and snore detection from the sleep data.
20. The sleep data acquisition system in claim 16, wherein the portable, wearable patient interface box further comprises an A/D converter and a digital memory for receiving the sleep data.

**CERTIFICATE OF COMPLIANCE**

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that foregoing  
**PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO.  
11,690,512** exclusive of the parts exempted as provided in 37 C.F.R. §42.24(a),  
contains 13,952 words and therefore complies with the type-volume limitations of  
37 C.F.R. §42.24(a).

Dated: December 6, 2024

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**CERTIFICATE OF SERVICE**

I hereby certify that a true and correct copy of the foregoing **PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO 11,690,512 AND EXHIBITS EX1001-1076** are being served on December 6, 2024, via FedEx overnight mail on counsel of record for U.S. Patent No. 11,690,512, as addressed below:

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