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(54) **BAND IDENTIFICATION FOR A WEARABLE COMPUTING DEVICE**

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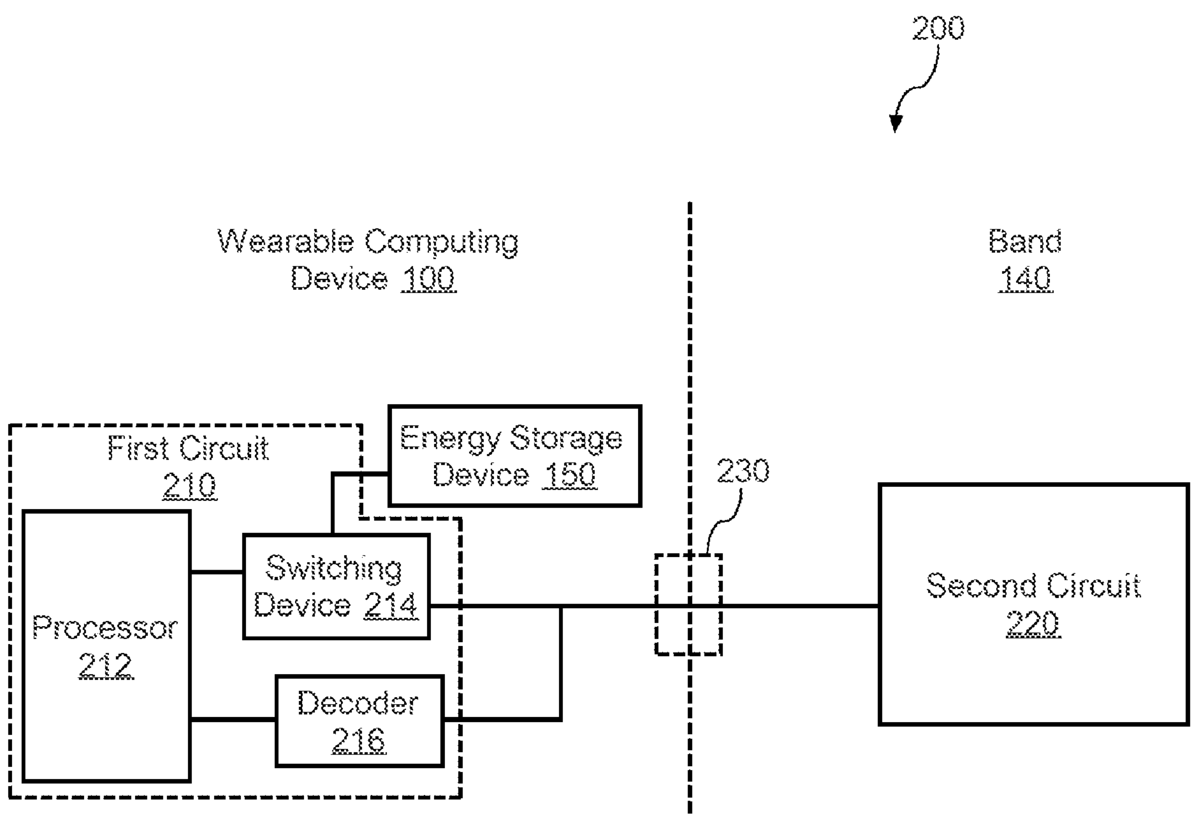
(57) **ABSTRACT**

A wearable computing device includes a housing, an energy storage device and a power interface configured to deliver electrical power from the energy storage device to a circuit included on a band that is removably coupled to the housing. The wearable computing device includes a switching device configured to selectively couple the energy storage device to the power interface. The wearable computing device includes a processor configured to control operation of the switching device to couple the energy storage device to the power interface to deliver the electrical power to the circuit included on that band. The processor is configured to obtain data from the circuit on the band that is indicative of a unique identifier for the band. The processor is configured to control operation of the wearable computing device based. at least in part. on the data indicative of the unique identifier for the band.



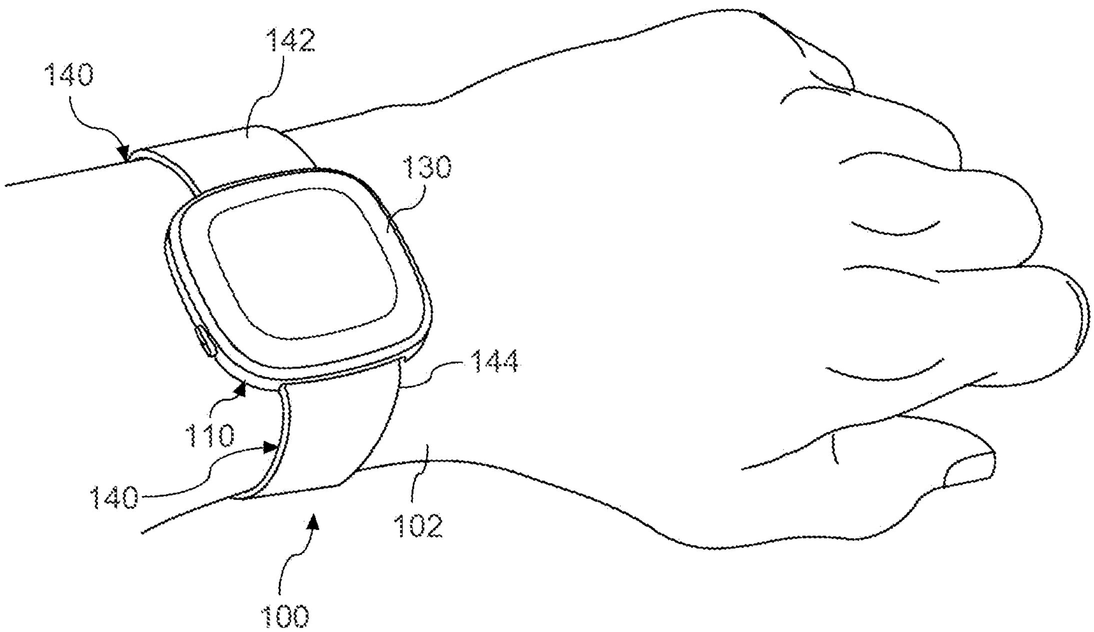


FIG. 1

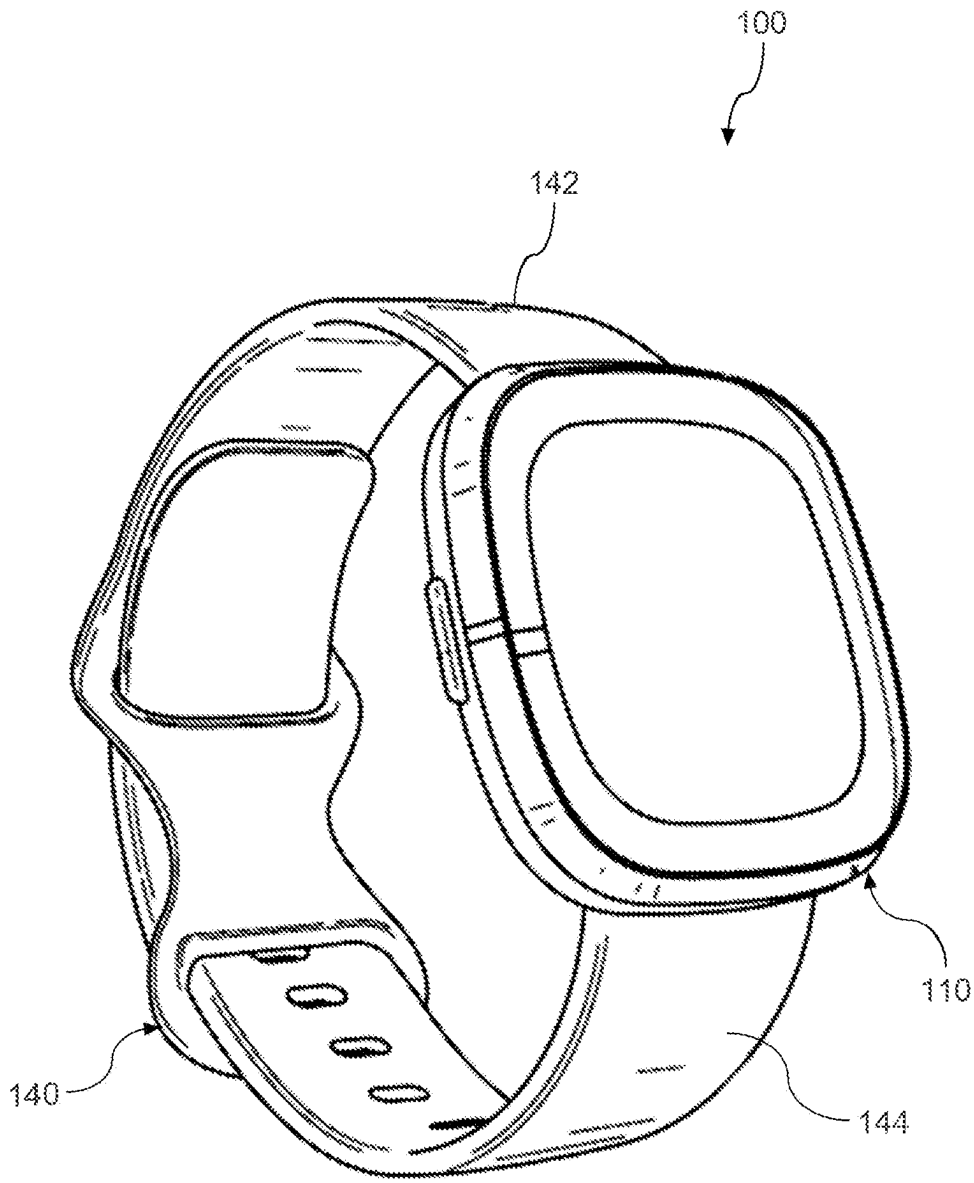


FIG. 2

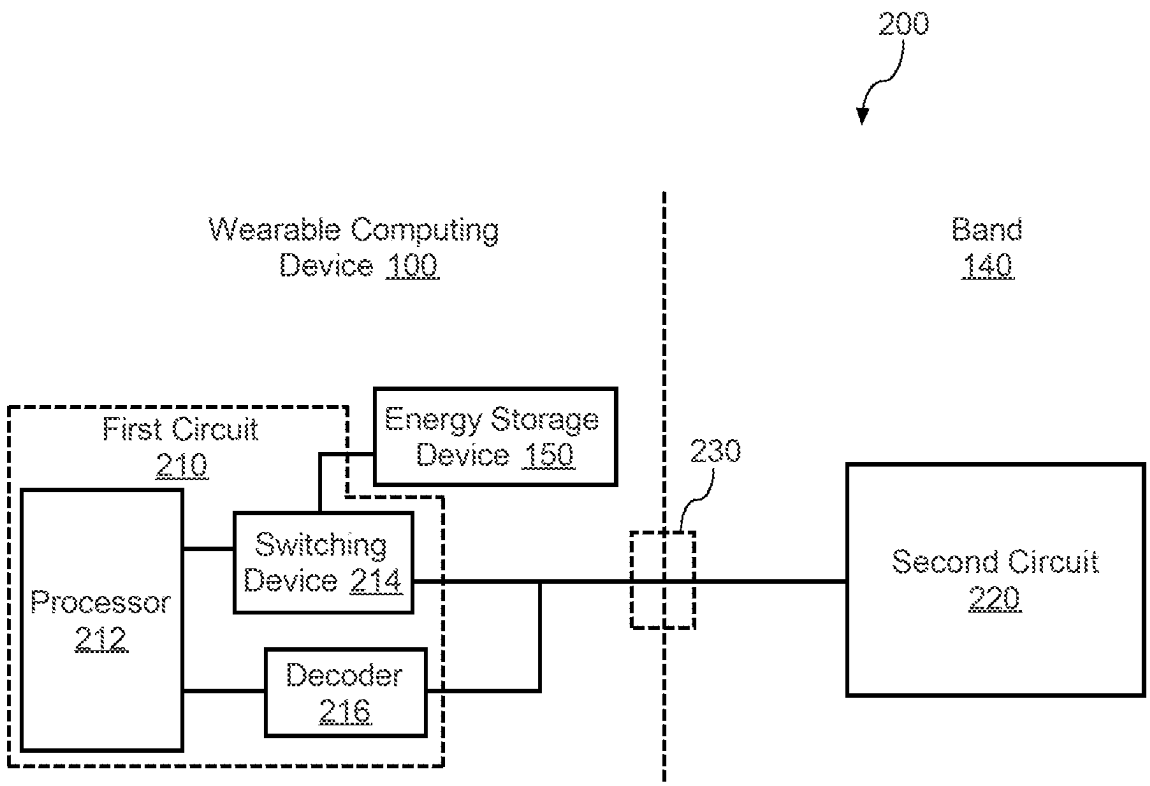

200
Wearable Computing Device 100
Band 140
First Circuit 210
Energy Storage Device 150
230
Switching Device 214
Processor 212
Decoder 216
Second Circuit 220

FIG. 3

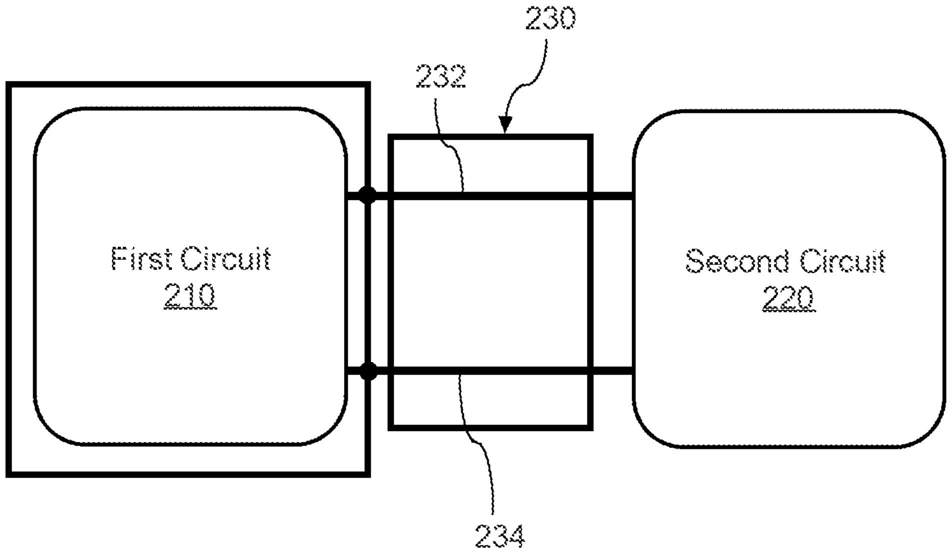


FIG. 4

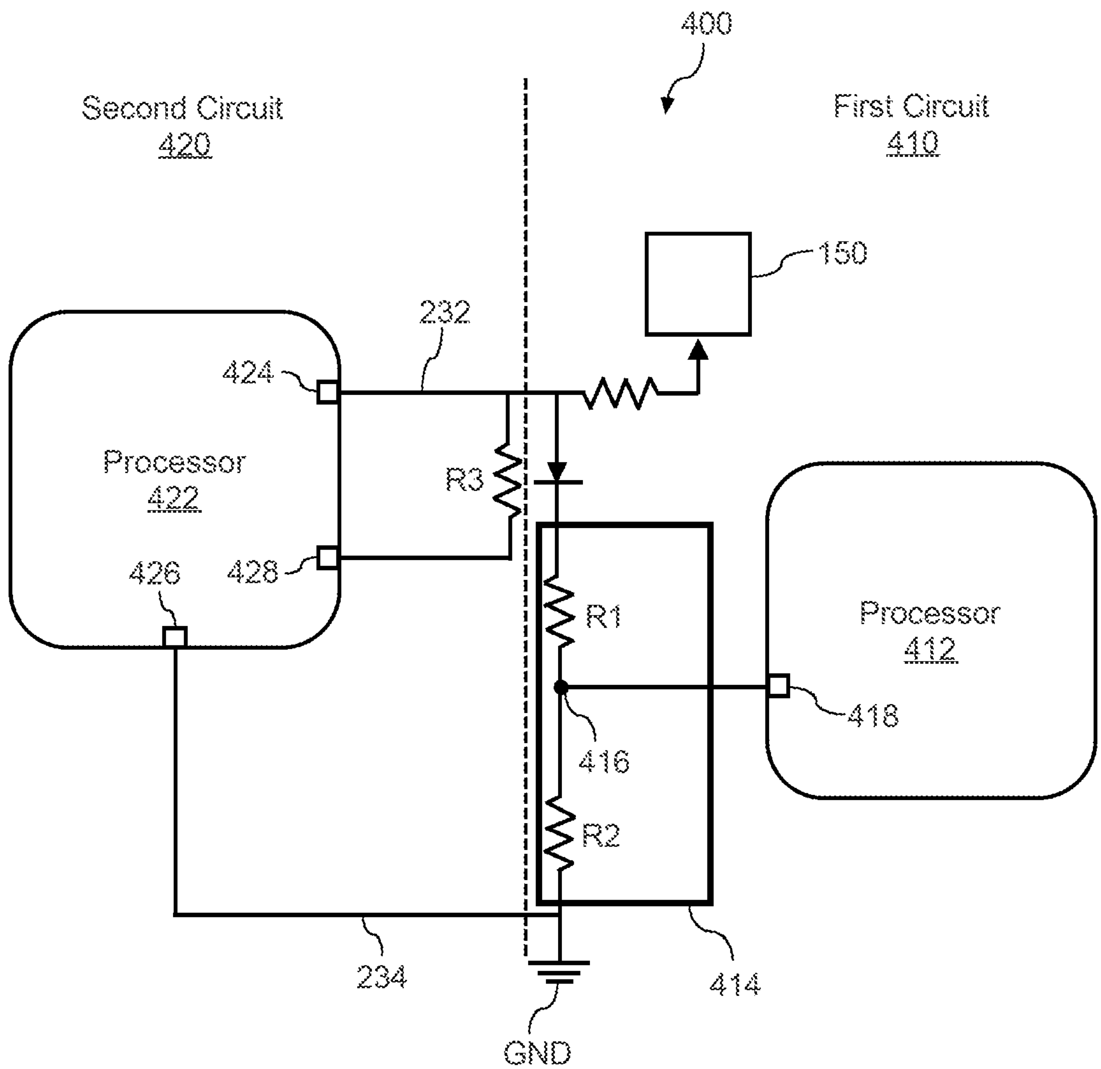

400
Second Circuit
420
First Circuit
410
150
232
424
Processor
422
R3
426
428
R1
Processor
412
418
416
R2
234
414
GND

FIG. 5

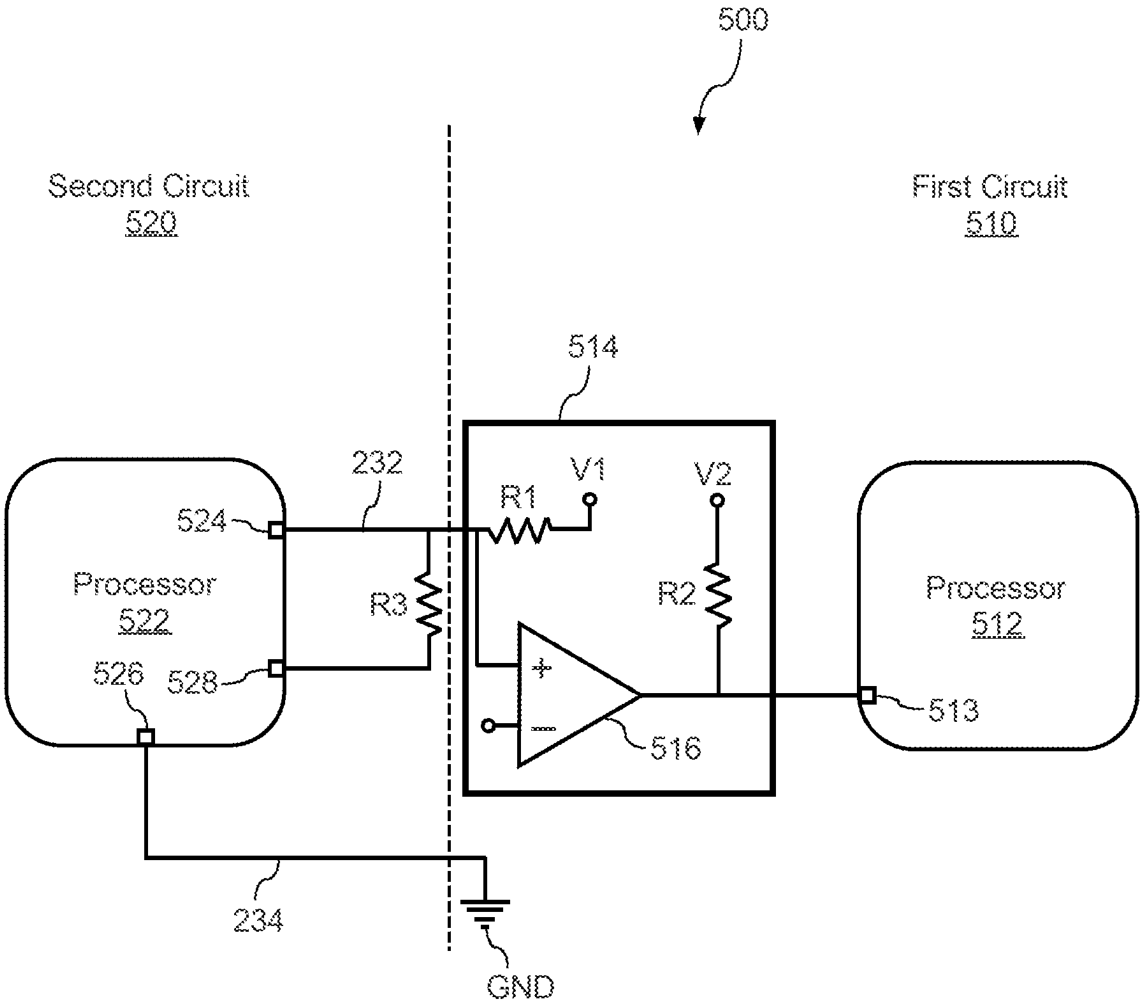

500
Second Circuit
520
First Circuit
510
514
232
R1
V1
V2
524
Processor
522
R3
R2
Processor
512
526
528
513
516
234
GND

FIG. 6

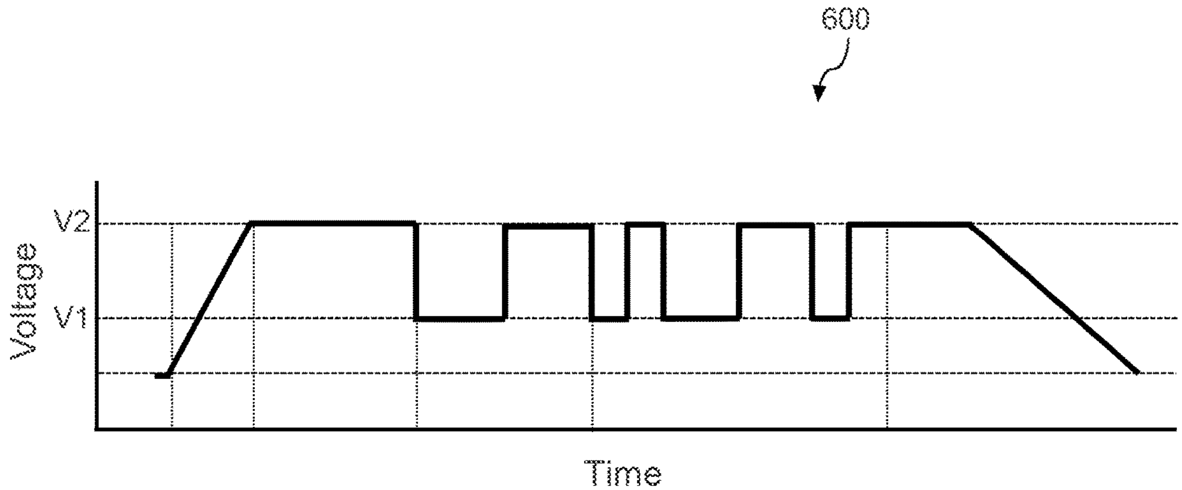


FIG. 7A

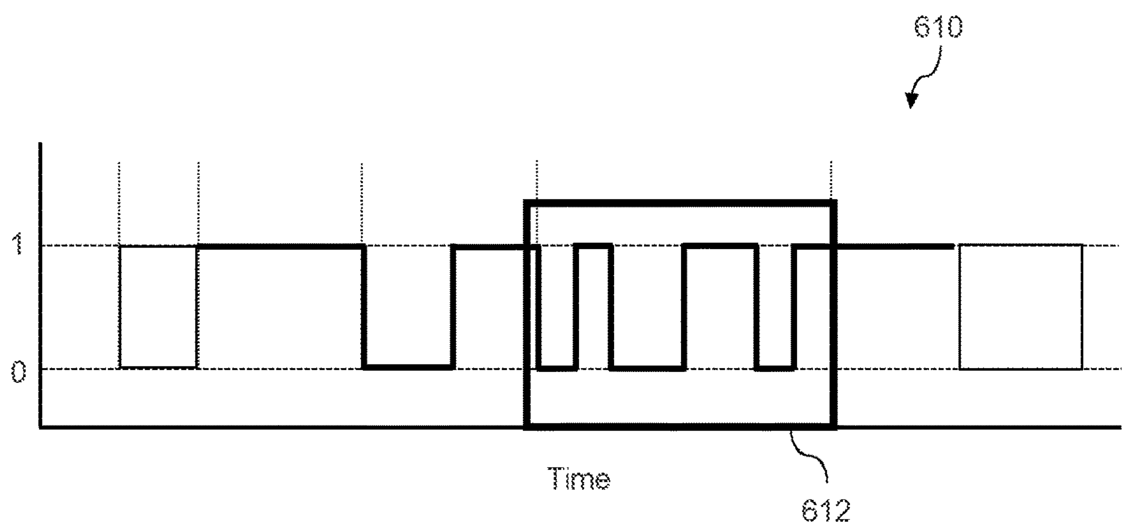


FIG. 7B

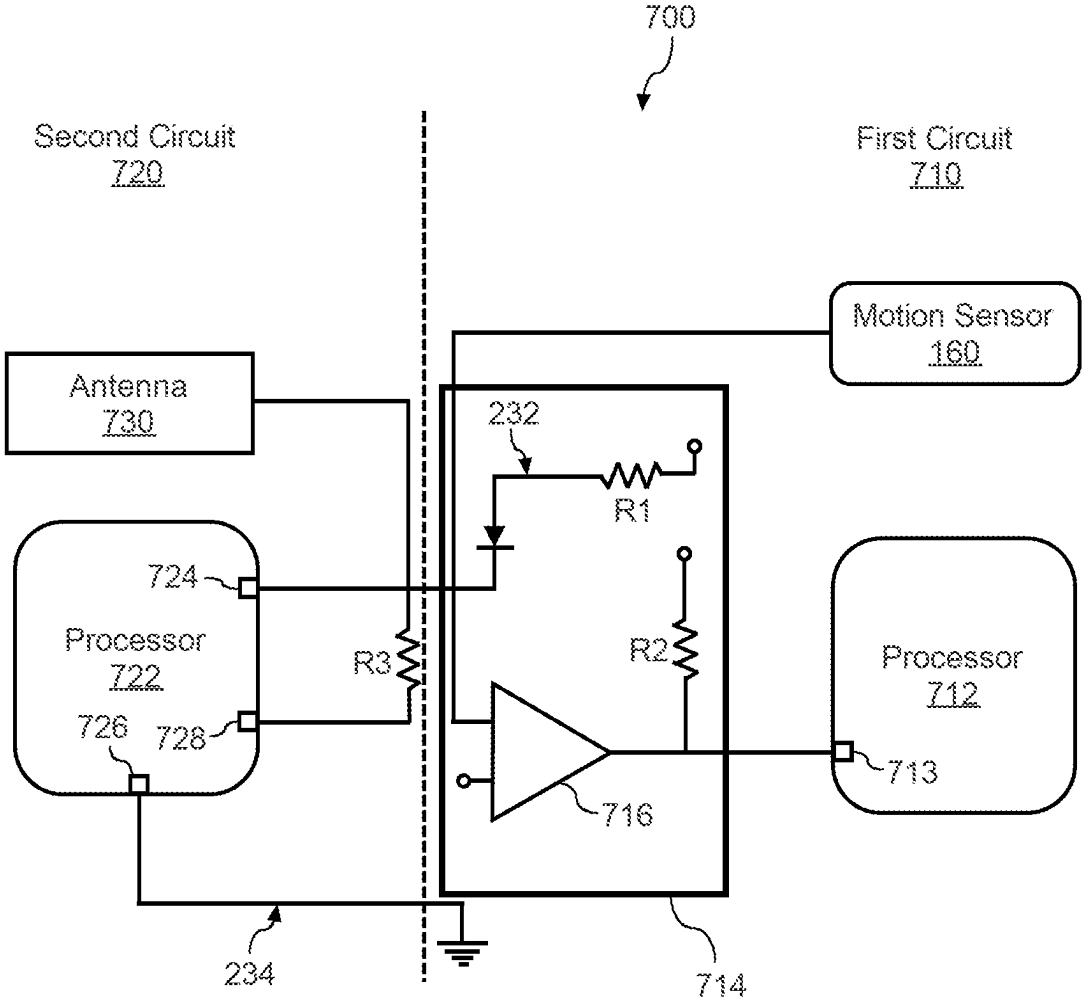

700
Second Circuit
720
First Circuit
710
Motion Sensor
160
Antenna
730
232
R1
724
Processor
722
R3
R2
Processor
712
726
728
713
716
234
714

FIG. 8

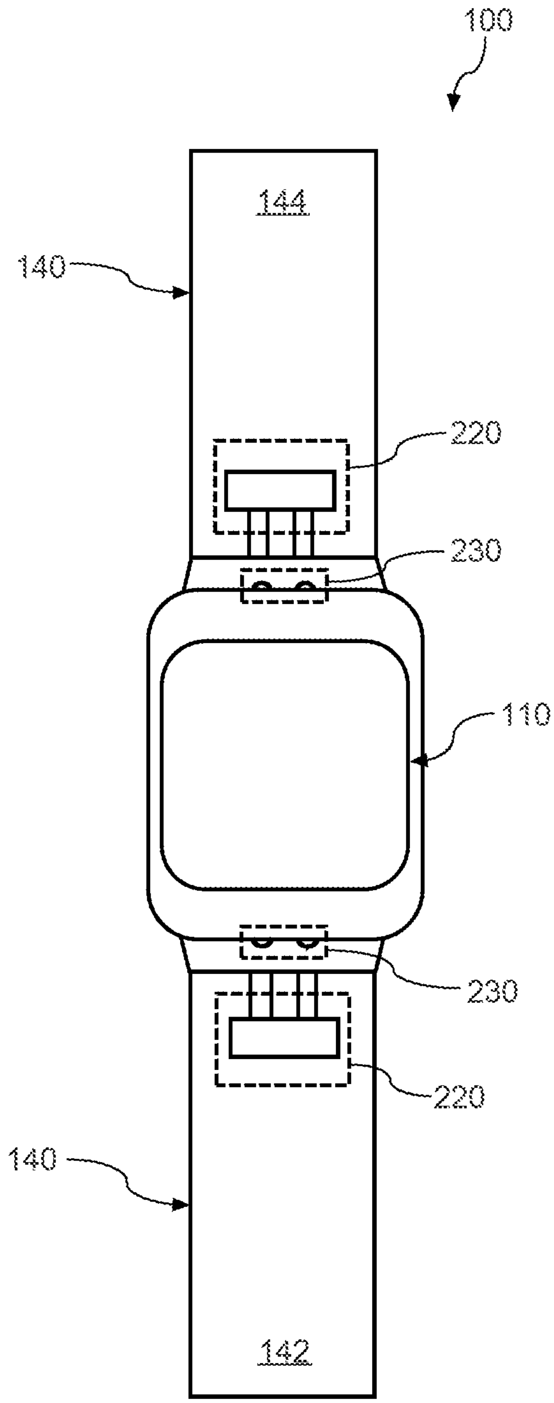


FIG. 9A

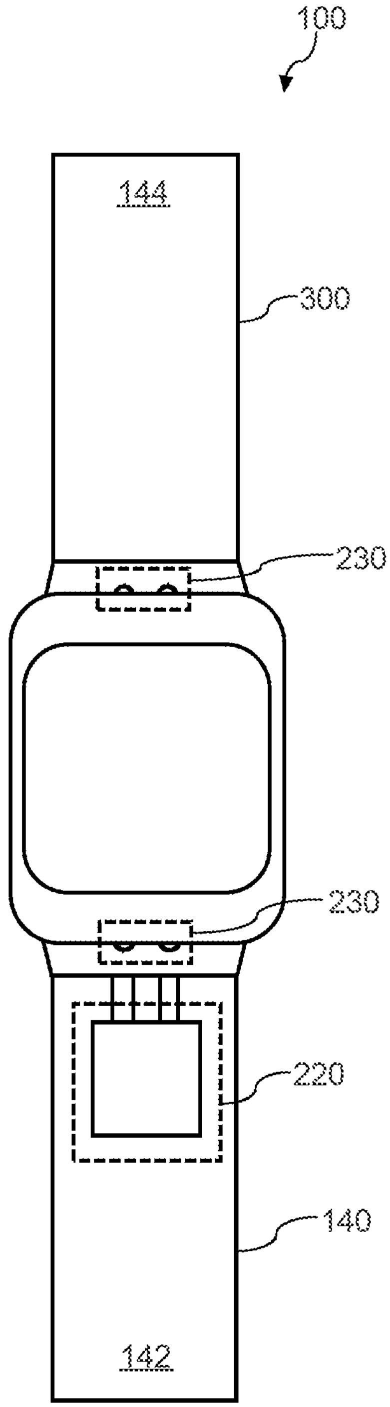


FIG. 9B

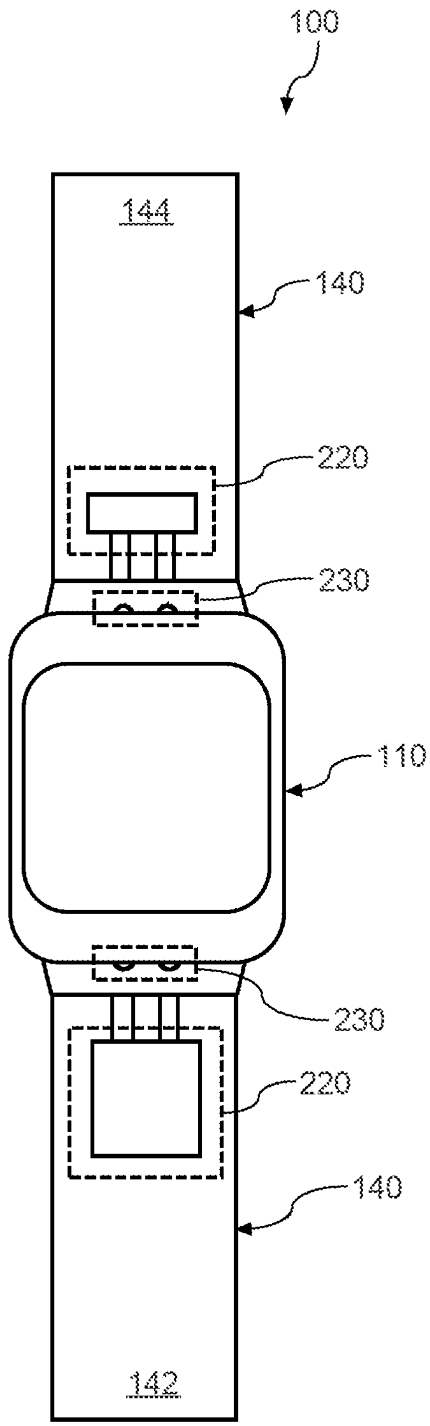


FIG. 9C

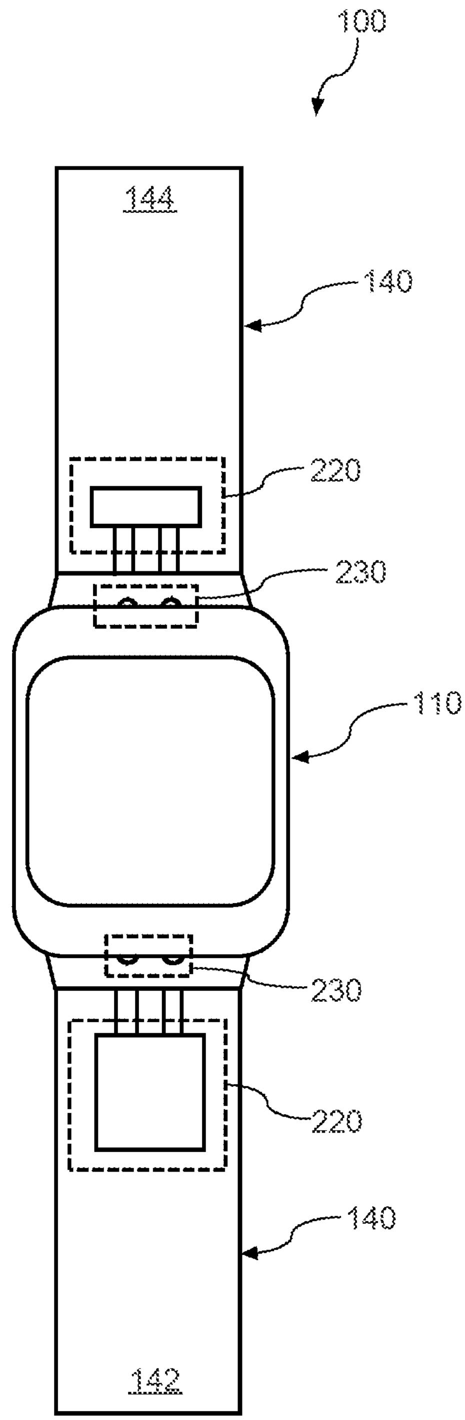


FIG. 9D

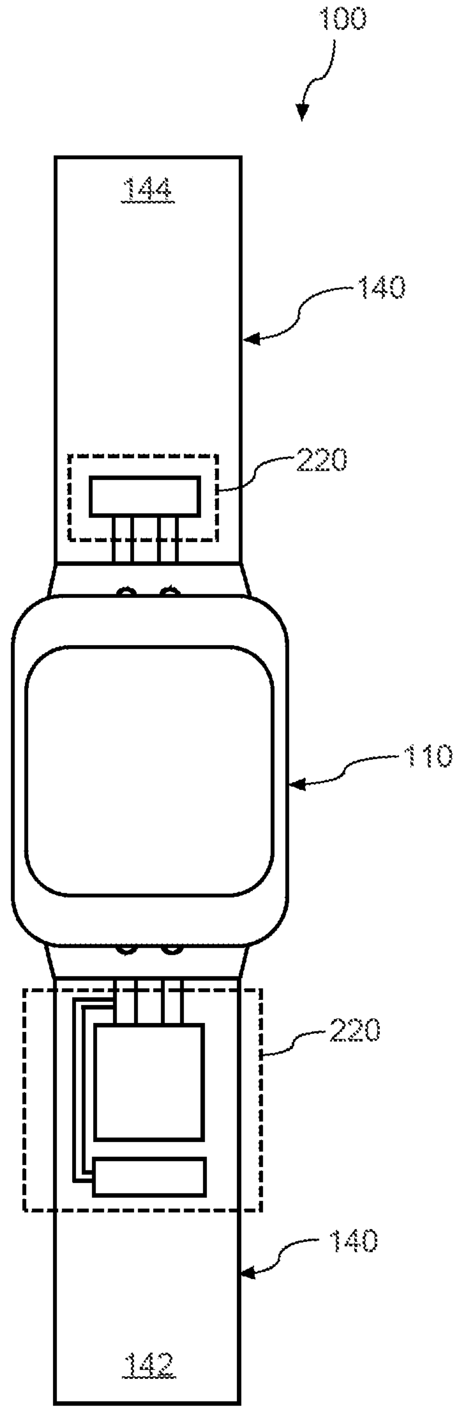


FIG. 9E

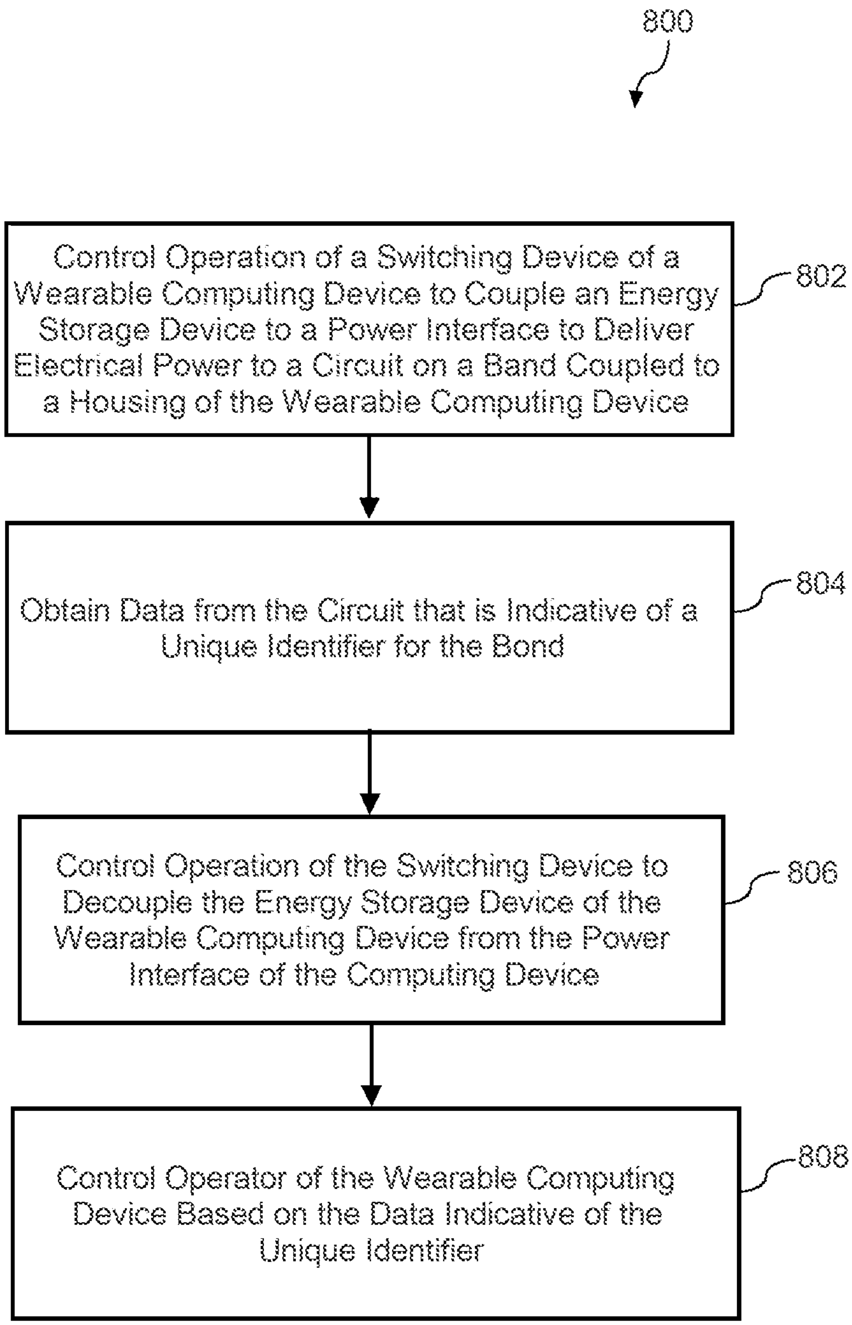

800
Control Operation of a Switching Device of a Wearable Computing Device to Couple an Energy Storage Device to a Power Interface to Deliver Electrical Power to a Circuit on a Band Coupled to a Housing of the Wearable Computing Device
802
Obtain Data from the Circuit that is Indicative of a Unique Identifier for the Bond
804
Control Operation of the Switching Device to Decouple the Energy Storage Device of the Wearable Computing Device from the Power Interface of the Computing Device
806
Control Operator of the Wearable Computing Device Based on the Data Indicative of the Unique Identifier
808

FIG. 10

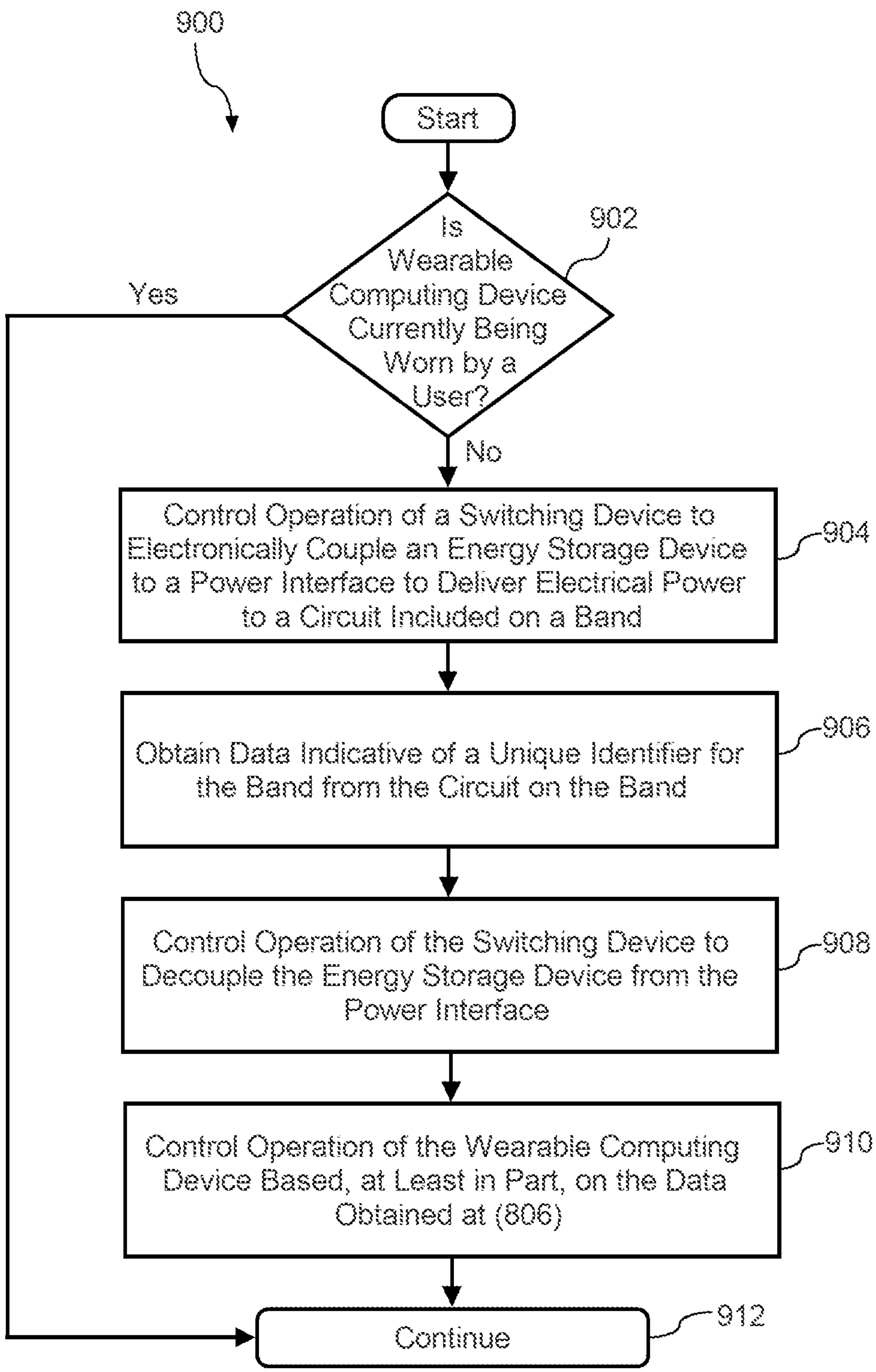

900
Start
Is Wearable Computing Device Currently Being Worn by a User?
902
Yes
No
Control Operation of a Switching Device to Electronically Couple an Energy Storage Device to a Power Interface to Deliver Electrical Power to a Circuit Included on a Band
904
Obtain Data Indicative of a Unique Identifier for the Band from the Circuit on the Band
906
Control Operation of the Switching Device to Decouple the Energy Storage Device from the Power Interface
908
Control Operation of the Wearable Computing Device Based, at Least in Part, on the Data Obtained at (806)
910
Continue
912

FIG. 11

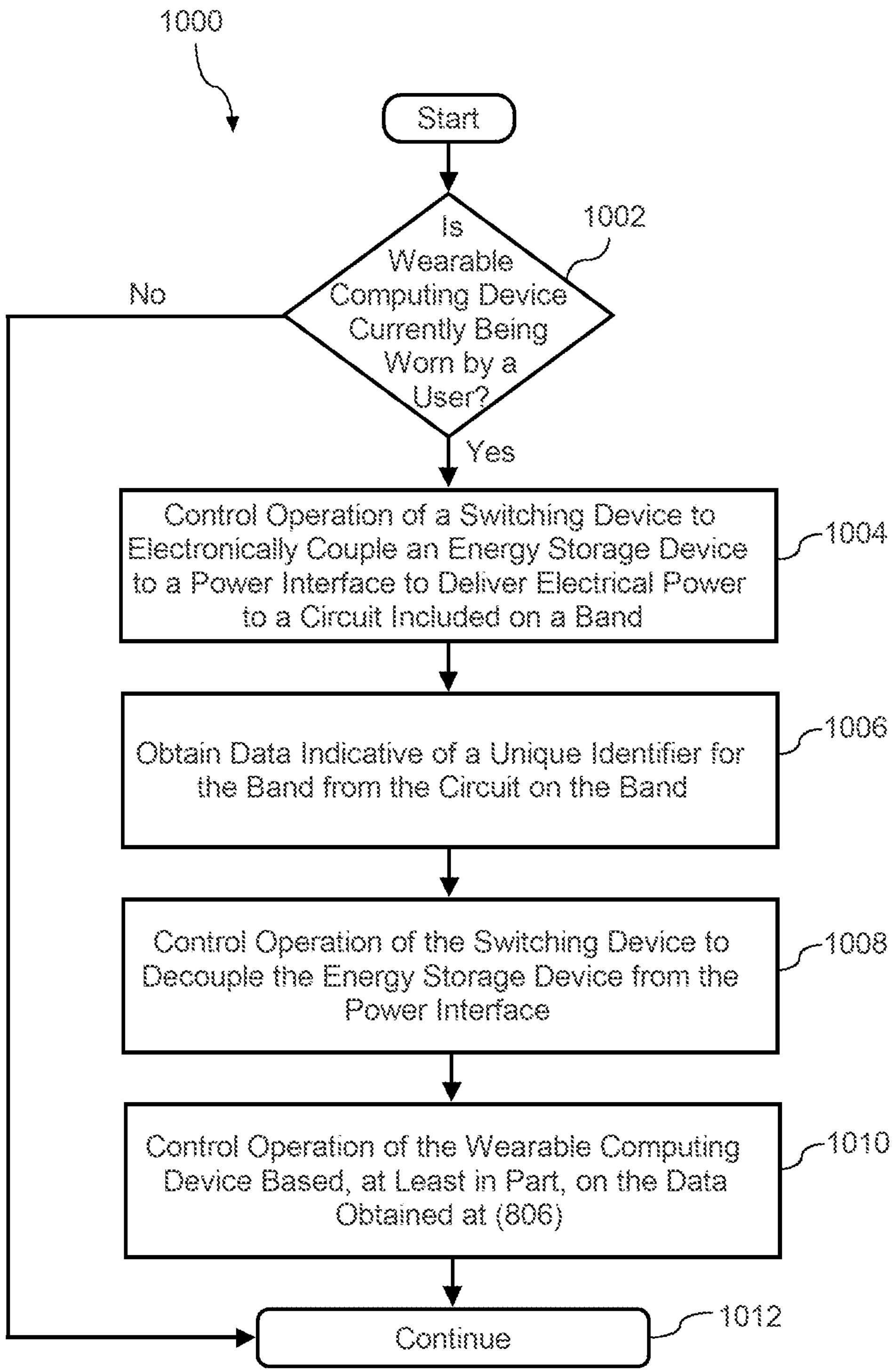

1000
Start
Is Wearable Computing Device Currently Being Worn by a User?
1002
No
Yes
Control Operation of a Switching Device to Electronically Couple an Energy Storage Device to a Power Interface to Deliver Electrical Power to a Circuit Included on a Band
1004
Obtain Data Indicative of a Unique Identifier for the Band from the Circuit on the Band
1006
Control Operation of the Switching Device to Decouple the Energy Storage Device from the Power Interface
1008
Control Operation of the Wearable Computing Device Based, at Least in Part, on the Data Obtained at (806)
1010
Continue
1012

FIG. 12

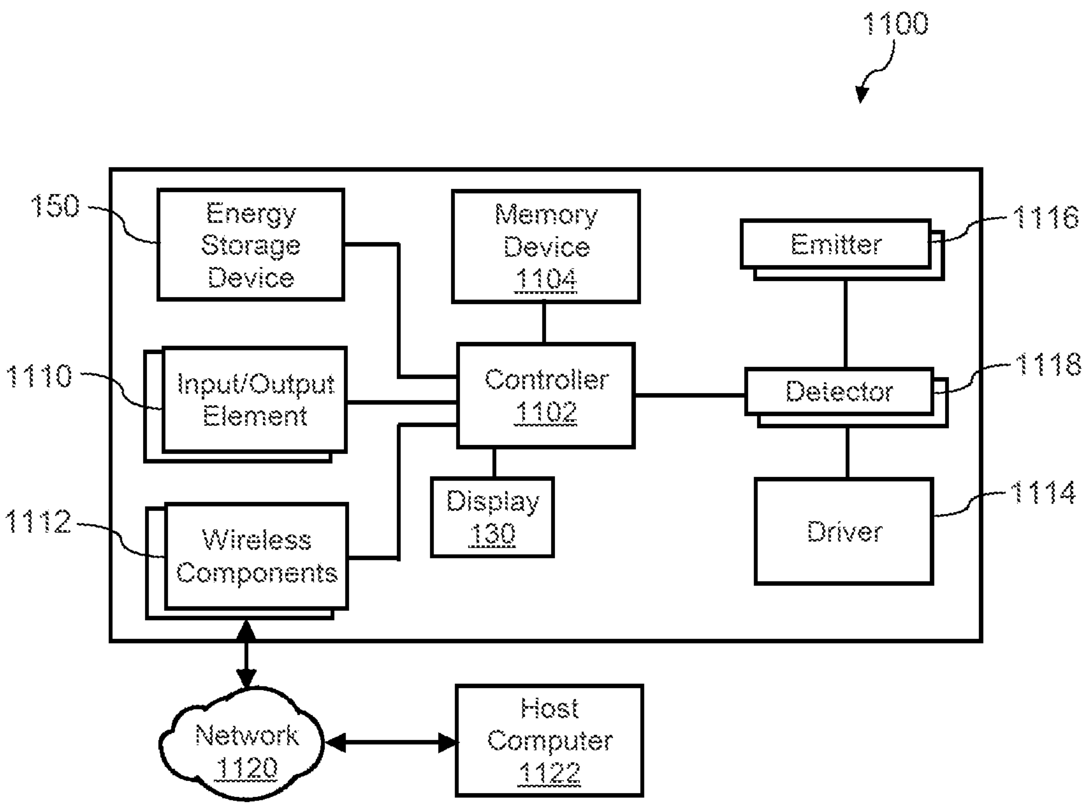

1100
150
Energy Storage Device
Memory Device 1104
Emitter
1116
1110
Input/Output Element
Controller 1102
Detector
1118
1112
Wireless Components
Display 130
Driver
1114
Network 1120
Host Computer 1122

FIG. 13

BAND IDENTIFICATION FOR A WEARABLE COMPUTING DEVICE

FIELD

[0001] The present disclosure relates generally to wearable computing devices. More particularly, the present disclosure relates to identifying a band that is used to fasten a wearable computing device to a user's appendage (e.g., wrist).

BACKGROUND

[0002] Wearable computing devices can be fastened to the user's wrist via a band that can be removably coupled to a housing of the wearable computing device. In this manner, the band can be an accessory to wearable computing devices. For example, a first band that is coupled to the housing of a wearable computing device can be decoupled from the housing and a second band that is different (e.g., color, material, etc.) than the first band can be coupled to the housing.

SUMMARY

[0003] Aspects and advantages of embodiments of the present disclosure will be set forth in part in the following description, or can be learned from the description, or can be learned through practice of the embodiments.

[0004] In one aspect, a wearable computing device is provided. The wearable computing device includes a housing, an energy storage device and a power interface. The power interface is configured to deliver electrical power from the energy storage device to a circuit included on a band that is removably coupled to the housing. The wearable computing device further includes a switching device configured to selectively couple the energy storage device to the power interface. The wearable computing device further includes a processor configured to control operation of the switching device to couple the energy storage device to the power interface to deliver the electrical power to the circuit included on that band. The processor is further configured to obtain data from the circuit on the band. The data is indicative of a unique identifier for the band. The processor is further configured to control operation of the wearable computing device based, at least in part, on the data indicative of the unique identifier for the band.

[0005] In some embodiments, the power interface includes a first conductor for power and a second conductor for electrical ground.

[0006] In some embodiments, the processor is configured to obtain the data indicative of the unique identifier for the band via the first conductor of the power interface.

[0007] In some embodiments, the wearable computing device further includes one or more sensors and the processor is further configured to determine whether the wearable computing device is being worn by a user based, at least in part, on the data from the one or more sensors. In some embodiments, the one or more sensors include a heart rate sensor and the data obtained from the one or more sensors includes heart rate data.

[0008] In some embodiments, the processor is configured to control operation of the switching device to couple the energy storage device to the power interface in response to determining the wearable computing device is not being worn by the user based, at least in part, on the data obtained from the one or more sensors.

[0009] In some embodiments, the processor is further configured to control operation of the switching device to decouple the energy storage device from the power interface in response to obtaining the data indicative of the unique identifier for the band.

[0010] In some embodiments, the unique identifier identifies one or more features of the band. In some embodiments, the one or more features of the band include at least one of a material of the band or a color of the band.

[0011] In some embodiments, the unique identifier is indicative of the band including one or more sensors. In such embodiments, the processor is configured to obtain data from the one or more sensors on the band. Furthermore, in some embodiments, the processor is configured to obtain the data from the one or more sensors via the power interface.

[0012] In another aspect, a method for identifying a band coupled to a housing of a wearable computing device is provided. The method includes determining, via a processor of the wearable computing device, the wearable computing device is not being worn by a user. In response to determining the wearable computing device is not being worn by the user, the method further includes controlling, via the processor of the wearable computing device, a switching device of the wearable computing device to electrically couple an energy storage device of the wearable computing device to a power interface of the wearable computing device to transfer electrical power from the energy storage device to a circuit included on the band coupled to the housing of the wearable computing device. The method further includes obtaining, via the processor, data indicative of a unique identifier for the band from the circuit on the band. The method further includes controlling, via the processor, operation of the wearable computing device based, at least in part, on the unique identifier for the band.

[0013] In some embodiments, the operation of determining the wearable computing device is not being worn by the user includes obtaining data from one or more sensors of the wearable computing device and determining the band is coupled to the housing of the wearable computing device based, at least in part, on the data from the one or more sensors.

[0014] In some embodiments, controlling operation of the wearable computing device includes controlling, via the processor, operation of an electronic output device of the wearable computing device. In some embodiments, the electronic output device includes a display screen, the unique identifier indicates a color of the band, and controlling operation of the display screen includes adjusting a color of at least a portion of the display screen based, at least in part, on the color of the band.

[0015] These and other features, aspects, and advantages of various embodiments of the present disclosure will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate example embodiments of the present disclosure and, together with the description, serve to explain the related principles.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Detailed discussion of embodiments directed to one of ordinary skill in the art is set forth in the specification, which makes reference to the appended figures, in which:

[0017] FIG. **1** depicts a wearable computing device worn on an extremity of a user according to some implementations of the present disclosure.

[0018] FIG. **2** depicts a perspective view of the wearable computing device of FIG. **1** according to some implementations of the present disclosure.

[0019] FIG. **3** depicts a block diagram of components of a system for identifying a band removably coupled to a housing of a wearable computing device according to some embodiments of the present disclosure.

[0020] FIG. **4** depicts a power interface of a system for identifying a band removably coupled to a housing of a wearable computing device according to some embodiments of the present disclosure.

[0021] FIG. **5** depicts a system for identifying a band removably coupled to a housing of a wearable computing device according to some embodiments of the present disclosure.

[0022] FIG. **6** depicts a system for identifying a band removably coupled to a housing of a wearable computing device according to some embodiments of the present disclosure.

[0023] FIG. **7**A depicts a voltage signal at the processor on the band in FIG. **6** as a function of time according to an embodiment of the present disclosure.

[0024] FIG. **7**B depicts a binary signal output by the processor on the band in FIG. **5** as a function of time according to an embodiment of the present disclosure.

[0025] FIG. **8** depicts a system for identifying a band removably coupled to a housing of a wearable computing device according to some embodiments of the present disclosure.

[0026] FIG. **9**A depicts a circuit on a band according to an embodiment of the present disclosure.

[0027] FIG. **9**B depicts a circuit on a band according to an embodiment of the present disclosure.

[0028] FIG. **9**C depicts a circuit on a band according to an embodiment of the present disclosure.

[0029] FIG. **9**D depicts a circuit on a band according to an embodiment of the present disclosure.

[0030] FIG. **9**E depicts a circuit on a band according to an embodiment of the present disclosure.

[0031] FIG. **10** depicts a flow diagram of a method for identifying a band removably coupled to a wearable computing device according to an embodiment of the present disclosure.

[0032] FIG. **11** depicts another flow diagram of a method for identifying a band removably coupled to a wearable computing device according to an embodiment of the present disclosure.

[0033] FIG. **12** depicts yet another flow diagram of a method for identifying a band removably coupled to a wearable computing device according to an embodiment of the present disclosure.

[0034] FIG. **13** depicts components of a computing system for a wearable computing device according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0035] Reference now will be made in detail to embodiments of the present disclosure, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the present disclosure, not limitation of the present disclosure. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present disclosure without departing from the scope or spirit of the disclosure. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

[0036] Example aspects of the present disclosure are directed to a system for identifying which of a plurality of different bands (e.g., wrist bands) is currently removably coupled to a housing of a wearable computing device. The system can include a first circuit that is part of the wearable computing device and a second circuit that is part of each the plurality of different bands. The system can further include a power interface configured to deliver electrical power from an energy storage device (e.g., battery, capacitor) of the wearable computing device to the second circuit of one of the bands. The second circuit can communicate to the first circuit a unique identifier for the band. The first circuit can then identify the band based, at least in part, on the unique identifier.

[0037] The wearable computing device can be uniquely operated according to the identity of the band that is removably coupled to the housing of the wearable computing device. For instance, an electronic output device of the wearable computing device can be uniquely operated based, at least in part, on the identity of the band. In some embodiments, the electronic output device can include a display screen and a color of at least a portion of the display screen can be changed based on the identity of the band that is removably coupled to the housing of the wearable computing device. For example, in some embodiments, the color of the background of the display screen can be changed to match the color of the band. In such embodiments, it should be understood that the color of the band can be determined based, at least in part, on the unique identifier for the band.

[0038] In some embodiments the band can include one or more sensors (e.g. biometric sensors) that are not present on the wearable computing device. In such embodiments, the unique identifier can indicate the band includes the one or more sensors. Furthermore, in such embodiments, the wearable computing device can be operated to obtain data via the one or more sensors that are present on the band.

[0039] In some embodiments, the first circuit can be configured to identify the band when the user is not wearing the wearing the wearable computing device. For instance, the first circuit can obtain data from one or more sensors (e.g., heart rate sensors, motion sensors, etc.) that is indicative of whether the user is wearing the wearable computing device. In this manner, the first circuit can obtain the unique identifier for the band while the wearable computing device is not being worn (e.g., off-wrist) by the user.

[0040] The disclosed technology can provide numerous technical effects and benefits. For instance, the wearable computing device according to the present disclosure can identify different bands being used by the user to secure the wearable computing device to the user's appendage (e.g., wrist). Furthermore, the wearable computing device can be uniquely operated based, at least in part, on the identity of the band that is removably coupled to the housing of the wearable computing device. More particularly, the wearable computing device can perform functions that are specific to the type of band that is currently attached to the housing of the wearable computing device, which can improve the user experience.

[0041] Referring now to the FIGS., FIGS. **1** and **2** depict a wearable computing device **100** according to an embodiment of the present disclosure. As shown, the wearable computing device **100** can be worn, for instance, on an arm **102** (e.g., wrist) of a user. The wearable computing device **100** can include a housing **110** defining a cavity in which one or more electronic components (e.g., disposed on printed circuit boards) are disposed. For instance, the wearable computing device **100** can include a printed circuit board **120** (e.g., flexible printed circuit board) disposed within the cavity. Furthermore, one or more electronic components can be included on the printed circuit board **120**. The wearable computing device **100** can further include a battery (not shown) that is disposed within the cavity defined by the housing **110**.

[0042] In some embodiments, the wearable computing device **100** includes a display **130**. The display **130** can display content (e.g., date, time, step count, heart rate, etc. etc.) for viewing by the user. It should be understood that the display **130** can include any suitable type of display. For instance, in some embodiments, the display **130** can be an organic light emitting diode (OLED) display. It should be understood that the display **130** can be positioned underneath a display cover. In this manner, the display **130** can be protected from being damaged (e.g., scratched, cracked). It should also be understood that the display cover can be transparent. In this manner, the user can view the display **130** through the display cover.

[0043] As shown, the wearable computing device **100** can be secured to the arm **102** (e.g., wrist) of the user via a band **140**. The band **140** can include a first portion **142** and a second portion **144** that is separate from the first portion **142**. The first portion **142** of the band **140** can be removably coupled to the housing **110** at a first location thereon. Conversely, the second portion **144** of the band **140** can be removably coupled to the housing **110** at a second location thereon that is different than the first location. For instance, the first location and the second location can be on opposing sides of the housing **110**.

[0044] It should be understood that the first portion **142** of the band **140** can be coupled to the second portion **144** of the band **140** to fasten the wearable computing device **100** to the arm **102** of the user. In some embodiments, the first portion **142** of the band **140** can include a buckle or clasp (not shown). Additionally, the second portion **144** of the band **140**) can include a plurality of apertures (not shown) spaced apart from one another along a length of the second portion **144** of the band **140**. In such embodiments, a prong of the buckle associated with the first portion **142** of the band **140** can extend through one of the plurality of openings defined by the second portion **144** of the band **140** to couple the first portion **142** of the band **140** to the second portion **144** of the band **140**.

[0045] It should be appreciated that the first portion **142** of the band **140** can be coupled to the second portion **144** of the band **140** using any suitable type of fastener. For instance, in some embodiments, the first portion **142** of the band **140** and the second portion **144** of the band **140** can include a magnet. In such embodiments, the first portion **142** of the band **140** and the second portion **144** of the band **140** can be magnetically coupled to one another to fasten the wearable computing device **100** to the arm **102** of the user. It should also be appreciated that the band **140** can be swapped out for different bands. For instance, the band **140** can be of a first type (e.g., color, material) and can be swapped out for a band of a second type that is different than the first type. In this manner, the band **140** can be an accessory to the wearable computing device **100** that can be customized according to the user's preferences.

[0046] Referring now to FIGS. **3** and **4**, a system **200** for identifying the band **140** coupled to the housing **110** (FIG. **1**) of the wearable computing device **100** is provided according to an embodiment of the present disclosure. As shown, the system **200** can be distributed across both the wearable computing device **100** and the band **140**. More particularly, the system **200** can include a first circuit **210** that is onboard (e.g., part of) the wearable computing device **100** and a second circuit **220** that is onboard (e.g., part of) the band **140**. In some embodiments, the second circuit **220** can be included on the first portion **142** (FIG. **2**) of the band **140** or the second portion **144** (FIG. **2**) of the band **140**. In alternative embodiments, the second circuit **220** can be included on both the first portion **142** of the band **140** and the second portion **144** of the band **140**. For instance, in some embodiments, a first instance of the second circuit **220** can be included on the first portion **142** of the band **140**) and a second instance of the second circuit **220** can be included on the second portion **144** of the band **140**.

[0047] The system **200** can include a power interface **230** configured to deliver electrical power from an energy storage device **150** (e.g., battery, capacitor, etc.) on the wearable computing device **100** to the second circuit **220** included on the band **140**. In some embodiments, the power interface **230** can include a first conductor **232** (e.g., wire) for delivering power from the energy storage device **150** (FIG. **3**) of the wearable computing device **100** to the second circuit **220** included on the band **140**. The power interface **230** can further include a second conductor **234** that is electrically grounded. It should be understood that the power interface **230** can be implemented on both the wearable computing device **100** and the band **140** as electrical contacts. For instance, the first conductor **232** of the power interface **230**) can be implemented as a first electrical contact on the wearable computing device **100** and the band **140**. Additionally, the second conductor **234** can be implemented as a second electrical contact on the wearable computing device **100** and the band **140**. It should be understood that the electrical contacts on the band **140** contact the respective contacts on the wearable computing device **100** when the band **140** is removably coupled to the housing **110** (FIG. **2**) of the wearable computing device **100**.

[0048] In some embodiments, the first circuit **210** can include a processor **212** and a switching device **214**. The switching device **214** can be electrically coupled between the energy storage device **150** and the power interface **230**. Furthermore, the processor **212** can be communicatively coupled to the switching device **214**. In this manner, the processor **212** can communicate one or more control signals associated with controlling operation of the switching device

214. For instance, the processor **212** can control operation of the switching device **214** to couple the energy storage device **150** to power interface **230** so that electrical power can be transferred from the energy storage device **150** to the second circuit **220** included on the band **140**. Conversely, the processor **212** can control operation of the switching device **214** to decouple the energy storage device **150** from the power interface **230** so that electrical power cannot be transferred from the energy storage device **150** to the second circuit **220** included on the band **140**.

[0049] In some embodiments, the processor **212** can control operation of the switching device **214** based, at least in part, on data obtained from one or more sensors of the wearable computing device **100**. For instance, in some embodiments, the processor **212** can control operation of the switching device **214** to couple the energy storage device **150** to the power interface **230** in response to determining the wearable computing device **100** is being worn by the user. In this manner, electrical power can be transferred from the energy storage device **150** to the second circuit **220** included on the band **140** when the wearable computing device **100** is being worn by the user.

[0050] In some embodiments, the processor **212** can control operation of the switching device **214** to couple the energy storage device **150** to the power interface in response to determining the wearable computing device **100** is not being worn by the user. In this manner, electrical power can be transferred from the energy storage device **150** to the second circuit **220** included on the band **140** when the wearable computing device **100** is not being worn by the user.

[0051] It should be understood, however, that any suitable sensor that is configured to obtain data indicative of whether the user is wearing the wearable computing device **100** is within the scope of the present disclosure. For instance, in some embodiments, the one or more sensors can include a motion sensor (e.g., accelerometer, inertial measurement unit, etc.). In alternative embodiments, the one or more sensors can include a heart rate sensor.

[0052] The second circuit **220** can be configured to communicate a unique identifier (e.g., code, address, etc.) for the band **140** to the first circuit **210**. The unique identifier can indicate one or more characteristics of the band **140**. For example, the unique identifier can indicate the color of the band **140**. Alternatively, or additionally, the unique identifier can indicate the material of the band **140**. For instance, the unique identifier can indicate whether the material of the band **140** is waterproof. In some embodiments, the unique identifier can indicate the band **140** includes one or more sensors (e.g., motion sensors, touch sensors, etc.). For instance, in some embodiments, the band **140** can include sensors that are not included on the wearable computing device **100**. In such embodiments, the band **140** can be attached to the housing **110** of the wearable computing device **100** to provide additional functionality (e.g., sensing capability).

[0053] In some embodiments, the second circuit **220** can be configured to modulate the unique identifier onto a signal to generate a modulated signal that is communicated to the wearable computing device **100**. For instance, in some embodiments, the second circuit **220**) can communicate the modulated signal to the first circuit **210** via the power interface **230**. In alternative embodiments, the second circuit **220** can communicate the modulated signal to the first circuit **210** via a wireless network. It should be understood that the second circuit **220** can be configured to implement any suitable modulation scheme. For instance, in some embodiments, the second circuit **220** can be configured to modulate the unique identifier onto the signal according to an on-off keying modulation scheme.

[0054] In some embodiments, the first circuit **210** can include a decoder **216** configured to decode the modulated signal received from the second circuit **220**. For instance, the decoder **216** can decode the modulated signal to obtain the unique identifier for the band **140**. Furthermore, the decoder **216** can communicate the unique identifier to the processor **212**.

[0055] Referring now to FIG. **5**, a system **400** for identifying the band **140** is provided according to an embodiment of the present disclosure. As shown, the system **400** can be distributed across both the wearable computing device **100** and the band **140**. For instance, the system **400** can include a first circuit **410** that is part of the wearable computing device **100** and a second circuit **420** that is part of the band **140**. Furthermore, the system **400** can include the power interface **230** discussed above with reference to FIGS. **3** and **4**.

[0056] The first circuit **410** on the wearable computing device **100** can include a processor **412**. The first circuit **410** can further include a voltage divider circuit **414** electrically coupled between the first conductor **232** (e.g., power) of the power interface **230** (FIG. **4**) and the second conductor **234** (e.g., ground) of the power interface **230**. The voltage divider circuit **414** can include a first resistor R**1** having a first resistance and a second resistor R**2** having a second resistance R**2** that is different (e.g., larger, smaller) than the first resistance of the first resistor R**1**.

[0057] The voltage divider circuit **414** can be configured to step down a voltage across the first conductor **232** and the second conductor **234** from a first voltage (e.g., about 5 Volts) to a second voltage. The second voltage can include a range of voltages (e.g., about 0.5 Volts to about 2 Volts). Furthermore, the processor **412** can be electrically coupled to the voltage divider circuit **414** at a node **416** that is positioned between the first resistor R**1** and the second resistor R**2**. In some embodiments, the processor **412** can include a general purpose input output (GPIO) pin that is electrically coupled to the node **416**. In this manner, the processor **412** can be configured to read the GPIO pin **418** to obtain the output (e.g., stepped down second voltage) of the voltage divider circuit **414**.

[0058] In some embodiments, the second circuit **420** on the band **140** can include a processor **422**. As shown, the processor **422** can be electrically coupled to the first conductor **232** of the power interface **230** (FIG. **4**). For instance, the processor **422** can include a voltage supply pin **424** that is electrically coupled to the first conductor **232** of the power interface **230**. The processor **422** can further include a ground pin **426** that is electrically coupled to the second conductor **234** of the power interface **230**.

[0059] The processor **422** can further include a general purpose input output (GPIO) pin **428** that is electrically coupled to the first conductor **232** of the power interface **230** (FIG. **4**). As shown, the second circuit **420** can include a resistor R**3** electrically coupled between the first conductor **232** and the GPIO pin **428**. In some embodiments, a resistance of the resistor R3 can be different than the resistance of the first and second resistors R1, R2 of the voltage divider circuit **414**.

[0060] In some embodiments, the processor **422** can be configured to control the GPIO pin **428** to communicate the unique identifier for the band **140**. For instance, the processor **422** can drive the GPIO pin **428** low for a first instance of time such that a voltage drop between the first conductor **232** and the second conductor **234** corresponds to a first voltage. Furthermore, the processor **422** can drive the GPIO pin **428** high such that a voltage drop between the first conductor **232** and the second conductor **234** corresponds to a second voltage that is different (e.g., greater) than the first voltage. It should be understood that the processor **422** can drive the GPIO pin **428** low or high by writing a first value (e.g., zero) or a second value (e.g., a one), respectively, to the GPIO pin **428**. For instance, in some embodiments, the processor **422** can write the first value to GPIO pin **428** to drive the GPIO pin low. Conversely, the processor **422** can write the second value to the GPIO pin **428** to drive the GPIO pin **428** high.

[0061] In some embodiments, the processor **412** of the first circuit **410** can be configured to read the GPIO pin **418** while the processor **422** of the second circuit **420** is driving the GPIO pin **428** thereof to communicate the unique identifier for the band **140**. In this manner, the processor **412** can obtain a plurality of voltage measurements for the output of the voltage divider circuit **414**.

[0062] The processor **412** can be configured to assign a binary value (e.g., a 1 or a 0) to each of the plurality of voltage measurements for the output of the voltage divider circuit **414**. For instance, the processor **412** can be configured to assign a first binary value (e.g., a 1) when the output of the voltage divider circuit **414** is equal to or greater than a threshold voltage and a second binary value (e.g., a 0) when the output of the voltage divider circuit **414** is less than the threshold voltage. In this manner, the plurality of voltage measurements for the output of the voltage divider circuit **414** can be converted into a digital signal from which the processor **412** can determine the identity of the band **140**.

[0063] Although the system **400** is discussed with reference to the second circuit **420** on the band **140** (FIG. **3**) communicating data (e.g., the unique identifier) to the first circuit **410** on the wearable computing device **100** (FIG. **3**), it should be understood that the system **400** is not intended to be limited in this manner. For instance, in some embodiments, the system **400** can be configured to allow bidirectional data communications between the first circuit **410** and the second circuit **420** through the power interface **230** (FIG. **4**).

[0064] Referring now to FIG. **6**, a system **500** for identifying the band **140** is provided according to an embodiment of the present disclosure. As shown, the system **500** can be distributed across both the wearable computing device **100** and the band **140**. For instance, the system **500** can include a first circuit **510** that is part of the wearable computing device **100** and a second circuit **520** that is part of the band **140**. Furthermore, the system **500** can include the power interface **230** discussed above with reference to FIGS. **3** and **4**.

[0065] The first circuit **510** can include a processor **512** and a comparator circuit **514**. As shown, the comparator circuit **514** can be electrically coupled between the first conductor **232** of the power interface **230** (FIG. **4**) and the second conductor **234** of the power interface **230**. The comparator circuit **514** can include a first resistor R1 to hold the first conductor **232** at a first potential V1 (e.g., about 3 Volts). The comparator circuit **514** can include an operational amplifier **516**. As shown, a first input (e.g., non-inverting input) of the operational amplifier **516** can be electrically coupled to the first conductor **232** of the power interface **230**. Furthermore, a second input (e.g., inverting input) of the operational amplifier **516** can be electrically coupled to a general purpose input output (GPIO) pin **513**. As shown, the comparator circuit **514** can include a second resistor R2 to hold the GPIO pin **513** at a second potential V2 that is less than the first potential V1.

[0066] In some embodiments, the second circuit **520** on the band **140** can include a processor **522**. As shown, the processor **522** can be electrically coupled to the first conductor **232** of the power interface **230** (FIG. **4**). For instance, the processor **522** can include a voltage supply pin **524** that is electrically coupled to the first conductor **232** of the power interface **230**. The processor **522** can further include a ground pin **526** that is electrically coupled to the second conductor **234** of the power interface **230**).

[0067] The processor **522** can further include a general purpose input output (GPIO) pin **528** that is electrically coupled to the first conductor **232** of the power interface **230** (FIG. **4**). As shown, the second circuit **520** can include a resistor R3 electrically coupled between the first conductor **232** and the GPIO pin **528**. In some embodiments, a resistance of the resistor R3 can be different than the resistance of the first and second resistors R1, R2 of the comparator circuit **514**.

[0068] In some embodiments, the processor **522** can be configured to control the GPIO pin **528** to communicate the unique identifier for the band **140**. For instance, the processor **522** can drive the GPIO pin **528** low for a first instance of time such that the first potential V1 corresponds to a first voltage. Furthermore, the processor **522** can drive the GPIO pin **528** high such that the first potential V1 corresponds to a second voltage that is different (e.g., greater) than the first voltage. It should be understood that the processor **522** can drive the GPIO pin **528** low or high by writing a first value (e.g., zero) or a second value (e.g., a one), respectively, to the GPIO pin **528**. For instance, in some embodiments, the processor **522** can write the first value to GPIO pin **528** to drive the GPIO pin low. Conversely, the processor **522** can write the second value to the GPIO pin **528** to drive the GPIO pin **528** high.

[0069] It should be understood that the operational amplifier **516** can compare the first potential V1 to the second potential V2 (e.g., reference potential). It should also be understood that the operational amplifier **516** can output a first value when the first potential V1 is greater than the second potential V2 and a second value when the first potential V2 is not greater than the second potential V2. It should also be understood that the processor **512** can determine the unique identifier for the band **140** based on changes in the output of the operational amplifier **516** when the processor **522** on the band is driving the GPIO pin **528** thereof to communicate the unique identifier.

[0070] Although the system **500** is discussed with reference to the second circuit **520** on the band **140** (FIG. **3**) communicating data (e.g., the unique identifier) to the first circuit **510** on the wearable computing device **100** (FIG. **3**), it should be understood that the system **500** is not intended to be limited in this manner. For instance, in some embodiments, the system **500** can be configured to allow bidirectional data communications between the first circuit **510** and the second circuit **520** through the power interface **230** (FIG. **4**).

[0071] Referring now to FIGS. **7**A and **7**B, two separate voltage signals are provided as a function of time according to embodiments of the present disclosure. FIG. **7**A depicts a voltage signal **600** measured at the voltage supply pin **524** (FIG. **6**) of the processor **522** (FIG. **6**) of the second circuit **520** (FIG. **6**) over a period of time. Additionally, FIG. **7**B depicts a binary signal **610** measured at the GPIO pin **528** (FIG. **6**) of the processor **522** (FIG. **6**) of the second circuit **520** (FIG. **6**) over the same period of time. It should be understood that the portion of the binary signal **610** denoted by box **612** indicates the unique identifier for the band **140** (FIG. **2**). For instance, the GPIO pin **528** can be driven low or high to communicate the unique identifier for the band **140**. It should be understood that driving the GPIO pin **528** low or high causes the voltage signal **600** to switch between a first voltage V**1** and a second voltage V**2**, respectively.

[0072] Referring now to FIG. **8**, a system **700** for identifying the band **140** is provided according to an embodiment of the present disclosure. As shown, the system **700** can be distributed across both the wearable computing device **100** and the band **140**. For instance, the system **700** can include a first circuit **710** that is part of the wearable computing device **100** and a second circuit **720** that is part of the band **140**. Furthermore, the system **700** can include the power interface **230** discussed above with reference to FIGS. **3** and **4**.

[0073] The first circuit **710** can include a processor **712** and a comparator circuit **714**. As shown, the comparator circuit **714** can be electrically coupled between the first conductor **232** of the power interface **230** (FIG. **4**) and the second conductor **234** of the power interface **230**. The comparator circuit **714** can include a first resistor R**1** to hold the first conductor **232** at a first potential V**1** (e.g., about 3 Volts). The comparator circuit **714** can include an operational amplifier **716**. As shown, a first input (e.g., non-inverting input) of the operational amplifier **716** can be electrically coupled to the first conductor **232** of the power interface **230**. Furthermore, a second input (e.g., inverting input) of the operational amplifier **516** can be electrically coupled to a general purpose input output (GPIO) pin **713**. As shown, the comparator circuit **714** can include a second resistor R**2** to hold the GPIO pin **713** at a second potential V**2** that is less than the first potential V**1**.

[0074] In some embodiments, the second circuit **720** on the band **140** can include a processor **722**. As shown, the processor **722** can be electrically coupled to the first conductor **232** of the power interface **230**) (FIG. **4**). For instance, the processor **722** can include a voltage supply pin **724** that is electrically coupled to the first conductor **232** of the power interface **230** (FIG. **4**). The processor **722** can further include a ground pin **726** that is electrically coupled to the second conductor **234** of the power interface **230**.

[0075] The processor **722** can further include a general purpose input output (GPIO) pin **728** that is electrically coupled to the first conductor **232** of the power interface **230** (FIG. **4**). As shown, the second circuit **720** can include a resistor R**3** electrically coupled between the first conductor **232** and the GPIO pin **728**. In some embodiments, a resistance of the resistor R**3** can be different than the resistance of the first and second resistors R**1**, R**2** of the comparator circuit **714**.

[0076] In some embodiments, the processor **722** of the second circuit **720** can be configured to control the GPIO pin **728** to communicate the unique identifier for the band **140**. For instance, the processor **722** can drive the GPIO pin **728** low for a first instance of time such that the first potential V**1** corresponds to a first voltage. Furthermore, the processor **722** can drive the GPIO pin **728** high such that the first potential V**1** corresponds to a second voltage that is different (e.g., greater) than the first voltage. It should be understood that the processor **722** can drive the GPIO pin **728** low or high by writing a first value (e.g., zero) or a second value (e.g., a one), respectively, to the GPIO pin **728**. For instance, in some embodiments, the processor **722** can write the first value to GPIO pin **728** to drive the GPIO pin low. Conversely, the processor **722** can write the second value to the GPIO pin **728** to drive the GPIO pin **728** high.

[0077] It should be understood that the operational amplifier **716** can compare the first potential V**1** to the second potential V**2** (e.g., reference potential). It should also be understood that the operational amplifier **716** can output a first value when the first potential V**1** is greater than the second potential V**2** and a second value when the first potential V**2** is not greater than the second potential V**2**. It should also be understood that the processor **712** can determine the unique identifier for the band **140** based on changes in the output of the operational amplifier **716** when the processor **722** on the band is driving the GPIO pin **728** thereof to communicate the unique identifier for the band **140**).

[0078] As shown, the wearable computing device **100** (FIG. **1**) can include a motion sensor **160** that is electrically coupled to the first conductor **232** of the power interface **230** (FIG. **4**). The motion sensor **160** can be configured to obtain motion data indicative of movement of the wearable computing device **100**. In this manner, the first circuit **710**, specifically the processor **712** thereof, can determine whether the user is wearing the wearable computing device **100** based, at least in part, on the motion data obtained via the motion sensor **160**. In some embodiments, the motion sensor can include an inertial measurement unit (IMU) sensor. It should be understood, however, that the motion sensor **160** can include any suitable type of sensor configured to detect motion. For instance, in some embodiments, the motion sensor **160** can include an accelerometer.

[0079] In some embodiments, the second circuit **720** on the band **140** can include an antenna **730**. As shown, the antenna **730** can be electrically coupled to the processor **722** of the second circuit. For instance, the antenna **730**) can be electrically coupled to the voltage supply pin **724** of the processor **722**. In some embodiments, the antenna **730** can be configured to communicate the unique identifier for the band **140** to the wearable computing device **100** via a wireless network. Alternatively, or additionally, the band **140** can include one or more sensors (e.g., capacitive sensors) and the antenna **730** can be configured to communicate data from the one or more sensors to the wearable computing device **100**. It should be understood that the wearable computing device **100** can include one or more antennas (not shown) to facilitate communication with the band **140** over the wireless network.

[0080] In some embodiments, the antenna **730**) can also function as an electrode to sense a touch event (e.g., capacitive sensor) or user movement (e.g., static change variation sensing). Furthermore, in some embodiments, the antenna **730**) can be communicatively coupled to the first circuit **710** on the wearable computing device **100**. In this manner, data indicative of motion/touch events sensed by the antenna **730** when functioning as an electrode can be communicated to the processor **712** of the first circuit **710** on the wearable computing device **100**. The first circuit **710** can be configured to process the data indicative of motion and/or touch events sensed by the antenna **730**. For instance, in some embodiments, the processor **712** of the first circuit **710** can be configured to implement a machine-learning model to classify the data sensed by the antenna **730** as one of a plurality of different motion/touch events. In alternative embodiments, the machine-learning model can be implemented by the motion sensor **160** of the wearable computing device **100** to classify the data sensed by the antenna **730** as one of the plurality of different motion/touch events.

[0081] Referring now to FIG. **9**A, an embodiment of the second circuit **220** on the band **140** is provided according to the present disclosure. As shown, the second circuit **220** can be included on the first portion **142** of the band **140** and the second portion **144** of the band **140**. In some embodiments, the second circuit **220** can include a resistor. For instance, in some embodiments, the second circuit **220** on the first portion **142** of the band **140** can include a resistor. It should be understood that the resistors can have a resistance value that is unique to the band **140**. In this manner, a voltage at the power interface **230** when the band **140** is coupled to the housing **110** of the wearable computing device **100** can uniquely identify the band **140**.

[0082] Referring now to FIG. **9**B, another embodiment of the second circuit **220** on the band **140** is provided according to the present disclosure. The second circuit **220** can include a logic circuit included on the first portion **142** of the band **140**. The logic circuit can be configured to communicate the unique identifier for the band **140**. In some embodiments, the second circuit **220** can be configured as the second circuit **420**, **520** depicted in FIGS. **5** and **6**.

[0083] Referring now to FIG. **9**C, yet another embodiment of the second circuit **220** on the band **140** is provided according to the present disclosure. In some embodiments, the second circuit **220** disposed on the first portion **142** of the band **140** can be a logic circuit configured to communicate a unique identifier for the first portion **142** of the band **140**. Additionally, the second circuit **220** disposed on the second portion **144** of the band **140** can be a resistor having a resistance value that can uniquely identify the second portion **144** of the band **140**. For instance, the resistor can cause the voltage at the power interface **230** to have a voltage value that uniquely identifies the second portion **144** of the band **140**.

[0084] Referring now to FIG. **9**D, still another embodiment of the second circuit **220** on the band **140** is provided according to the present disclosure. In some embodiments, the second circuit **220** disposed on the first portion **142** of the band **140** can be a logic circuit configured to communicate a unique identifier for the band **140**. Furthermore, the second circuit **220** disposed on the second portion **144** of the band **140** can include one or more sensors (e.g., capacitive sensors) configured to determine whether the band **140** is being worn by the user.

[0085] Referring now to FIG. **9**E, another embodiment of the second circuit **220** on the band **140** is provided according to the present disclosure. In some embodiments, the second circuit **220**) disposed on the first portion **142** of the band **140** can include a logic circuit configured to communicate a unique identifier for the band **140**. In addition, the second circuit **220** disposed on the first portion **142** of the band **140** can further include one or more sensors configured to determine whether the band **140** is being worn by the user. Furthermore, in some embodiments, the second circuit **220** disposed on the second portion **144** of the band **140**) can include one or more sensors configured to determine whether the band **140** is being worn by the user. In some embodiments, the one or more sensors on the second portion **144** of the band **140**) can be different from the one or more sensors on the first portion **142** of the band **140**).

[0086] It should be understood that the functionality of the band **140** depicted in FIGS. **9**A-**9**E is not intended to be limited to having a circuit (e.g., second circuit **220**) that stores and communicates a unique identifier for the band **140** to the wearable computing device **100**. For instance, in some embodiments, the band **140**) can include one or more motion sensors (e.g., accelerometer) configured to detect motion of the band **140**. Alternatively, or additionally, the one or more sensors included on the band **140** can include one or more touch sensors. In such embodiments, data from the one or more motion sensors, the one or more touch sensors, or both can be processed (e.g., via a machine-learning model) to determine whether the data is indicative of the user performing one or more movements (e.g., predefined gestures). In some embodiments, the wearable computing device **100** can perform one or more control actions in response to determining the data corresponds to a predefined gesture.

[0087] In some embodiments, the band **140** can include an output device. For instance, in some embodiments, the output device can include an LED indicator. In such embodiments, the LED indicator can be activated (e.g., turned on) when the band **140** is attached to the wearable computing device **100** and receiving electrical power from the energy storage device **150** (FIG. **2**) of the wearable computing device **100**. In this manner, the LED indicator can provide a visual notification to the user that the band **140** is attached to the wearable computing device **100** and is receiving electrical power from the energy storage device **150** of the wearable computing device **100**.

[0088] Referring now to FIG. **10**, a flow diagram of an example method **800** for identifying a band for a wearable computing device is provided according to an embodiment of the present disclosure. The method **800** can be implemented by, for instance, any of the systems **200**, **400**, **500**, **700** discussed above with reference to FIGS. **3**, **5**, **6**, and **8**. FIG. **10** depicts steps performed in a particular order for purposes of illustration and discussion. Those of ordinary skill in the art, using the disclosures provided herein, will understand that various steps of the method **800** or any of the other methods disclosed herein may be adapted, modified, rearranged, performed simultaneously, or modified in various ways without deviating from the scope of the present disclosure.

[0089] At (**802**), the method **800** can include controlling operation of a switching device to electrically couple an energy storage device of the wearable computing device to a power interface of the wearable computing device. In this manner, electrical power can be transferred from the energy storage device to a circuit included on the band that is removably coupled to the housing of the wearable computing device.

[0090] At (**804**), the method **800** can include obtaining data (e.g., unique identifier) from the circuit included on the band. In some embodiments, the circuit on the band can communicate the data to the wearable computing device via the power interface. More particularly, the circuit on the band can communicate the data via a power conductor of the power interface. In alternative embodiments, the circuit on the band can communicate the data over a wireless network to the wearable computing device. After obtaining the data, the method **800** can proceed to (**808**).

[0091] At (**806**), the method **800** can include controlling operation of the switching device to decouple the energy storage device of the wearable computing device from the power interface of the wearable computing device. In this manner, electrical power can no longer be transferred from the energy storage device to the circuit included on the band that is removably coupled to the housing of the wearable computing device.

[0092] At (**808**), the method **800** can include controlling operation of the wearable computing device based, at least in part, on the data obtained from the circuit on the band. For instance, in some embodiments, an electronic output device of the wearable computing device can be uniquely operated based, at least in part, on the data obtained at (**804**). In some embodiments, the electronic output device can include a display screen and a color of at least a portion of the display screen can be changed based on the identity of the band that is removably coupled to the housing of the wearable computing device. For example, in some embodiments, the color of the background of the display screen can be changed to match the color of the band. In such embodiments, it should be understood that the color of the band can be determined based, at least in part, on the unique identifier for the band.

[0093] Referring now to FIG. **11**, a flow diagram of an example method **900** for identifying a band for a wearable computing device is provided according to an embodiment of the present disclosure. The method **900** can be implemented by, for instance, any of the systems **200**, **400**, **500**, **700** discussed above with reference to FIGS. **3**, **5**, **6**, and **8**. FIG. **11** depicts steps performed in a particular order for purposes of illustration and discussion. Those of ordinary skill in the art, using the disclosures provided herein, will understand that various steps of the method **900** or any of the other methods disclosed herein may be adapted, modified, rearranged, performed simultaneously, or modified in various ways without deviating from the scope of the present disclosure.

[0094] At (**902**), the method **900** can include determining whether a wearable computing device is being worn by a user. In some embodiments, a first circuit on the wearable computing device can obtain data from one or more sensors configured to obtain data (e.g., motion data, heart rate data, etc.) indicative of whether the wearable computing device is being worn by the user. When the first circuit determines, based on the data from the one or more sensors, the wearable computing device is not being worn by the person, the method **900** proceeds to (**904**). Otherwise, the method **900** continues to (**912**).

[0095] At (**904**), the method **900** can include controlling operation of a switching device to electrically couple an energy storage device of the wearable computing device to a power interface of the wearable computing device. In this manner, electrical power can be transferred from the energy storage device to a circuit included on the band that is removably coupled to the housing of the wearable computing device.

[0096] At (**906**), the method **900** can include obtaining data (e.g., unique identifier) from the circuit included on the band. In some embodiments, the circuit on the band can communicate the data to the wearable computing device via the power interface. More particularly, the circuit on the band can communicate the data via a power conductor of the power interface. In alternative embodiments, the circuit on the band can communicate the data over a wireless network to the wearable computing device. After obtaining the data, the method **900** can proceed to (**908**).

[0097] At (**908**), the method **900** can include controlling operation of the switching device to decouple the energy storage device of the wearable computing device from the power interface of the wearable computing device. In this manner, electrical power can no longer be transferred from the energy storage device to the circuit included on the band that is removably coupled to the housing of the wearable computing device.

[0098] At (**910**), the method **900** can include controlling operation of the wearable computing device based, at least in part, on the data obtained from the circuit on the band. For instance, in some embodiments, an electronic output device of the wearable computing device can be uniquely operated based, at least in part, on the data obtained at (**906**). In some embodiments, the electronic output device can include a display screen and a color of at least a portion of the display screen can be changed based on the identity of the band that is removably coupled to the housing of the wearable computing device. For example, in some embodiments, the color of the background of the display screen can be changed to match the color of the band. In such embodiments, it should be understood that the color of the band can be determined based, at least in part, on the unique identifier for the band.

[0099] In some embodiments the band can include one or more sensors (e.g. biometric sensors) that are not present on the wearable computing device. In such embodiments, the unique identifier can indicate the band includes the one or more sensors. Furthermore, in such embodiments, the wearable computing device can be operated to obtain data via the one or more sensors that are present on the band. In this manner, the wearable computing device can provide additional functionality due, at least in part, to the presence of the one or more sensors on the band.

[0100] At (**912**), the method **900** can continue. For instance, in some embodiments, the method **900** can end. In alternative embodiments, the method **900** can remain at (**902**) and continue to obtain data from the one or more sensors of the wearable computing device until the data obtained from same indicates that the wearable computing device is not being worn by the user and the method can proceed to (**904**).

[0101] Referring now to FIG. **12**, a flow diagram of an example method **1000** for identifying a band for a wearable computing device is provided according to an embodiment of the present disclosure. The method **1000** can be implemented by, for instance, any of the systems **200**, **400**, **500**, **700** discussed above with reference to FIGS. **3**, **5**, **6**, and **8**. FIG. **12** depicts steps performed in a particular order for purposes of illustration and discussion. Those of ordinary skill in the art, using the disclosures provided herein, will understand that various steps of the method **1000** or any of the other methods disclosed herein may be adapted, modified, rearranged, performed simultaneously, or modified in various ways without deviating from the scope of the present disclosure.

[0102] At (**1002**), the method **1000** can include determining whether a wearable computing device is being worn by a user. In some embodiments, a first circuit on the wearable computing device can obtain data from one or more sensors configured to obtain data (e.g., motion data, heart rate data, etc.) indicative of whether the wearable computing device is being worn by the user. When the first circuit determines, based on the data from the one or more sensors, the wearable computing device is being worn by the person, the method **1000** proceeds to (**1004**). Otherwise, the method **1000** continues to (**1012**).

[0103] At (**1004**), the method **1000** can include controlling operation of a switching device to electrically couple an energy storage device of the wearable computing device to a power interface of the wearable computing device. In this manner, electrical power can be transferred from the energy storage device to a circuit included on the band that is removably coupled to the housing of the wearable computing device.

[0104] At (**1006**), the method **1000** can include obtaining data (e.g., unique identifier) from the circuit included on the band. In some embodiments, the circuit on the band can communicate the data to the wearable computing device via the power interface. More particularly, the circuit on the band can communicate the data via a power conductor of the power interface. In alternative embodiments, the circuit on the band can communicate the data over a wireless network to the wearable computing device. After obtaining the data, the method **1000** can proceed to (**1008**).

[0105] At (**1008**), the method **1000** can include controlling operation of the switching device to decouple the energy storage device of the wearable computing device from the power interface of the wearable computing device. In this manner, electrical power can no longer be transferred from the energy storage device to the circuit included on the band that is removably coupled to the housing of the wearable computing device.

[0106] At (**1010**), the method **1000** can include controlling operation of the wearable computing device based, at least in part, on the data obtained from the circuit on the band. For instance, in some embodiments, an electronic output device of the wearable computing device can be uniquely operated based, at least in part, on the data obtained at (**1006**). In some embodiments, the electronic output device can include a display screen and a color of at least a portion of the display screen can be changed based on the identity of the band that is removably coupled to the housing of the wearable computing device. For example, in some embodiments, the color of the background of the display screen can be changed to match the color of the band. In such embodiments, it should be understood that the color of the band can be determined based, at least in part, on the unique identifier for the band.

[0107] In some embodiments the band can include one or more sensors (e.g. biometric sensors) that are not present on the wearable computing device. In such embodiments, the unique identifier can indicate the band includes the one or more sensors. Furthermore, in such embodiments, the wearable computing device can be operated to obtain data via the one or more sensors that are present on the band. In this manner, the wearable computing device can provide additional functionality due, at least in part, to the presence of the one or more sensors on the band.

[0108] At (**1012**), the method **1000** can continue. For instance, in some embodiments, the method **800** can end. Alternatively, the method **1000** can remain at (**1002**) and continue to obtain data from the one or more sensors of the wearable computing device until the data obtained from same indicates that the wearable computing device is not being worn by the user and the method can proceed to (**1004**).

[0109] Referring now to FIG. **13**, components of an example computing system **1100** of the wearable computing device **100** that can be utilized in accordance with various embodiments are illustrated. In particular, as shown, the computing system **1100** may also include at least one controller **1102**. Moreover, in an embodiment, the controller (s) **1102** can be a central processing unit (CPU) or graphics processing unit (GPU) for executing instructions that can be stored in a memory device **1104**, such as flash memory or DRAM, among other such options. For example, in an embodiment, the memory device **1104** may include RAM, ROM, FLASH memory, or other non-transitory digital data storage, and may include a control program comprising sequences of instructions which, when loaded from the memory device **1104** and executed using the controller(s) **1102**, cause the controller(s) **1102** to perform the functions that are described herein.

[0110] The computing system **1100** can include many types of memory, data storage, or computer-readable media, such as data storage for program instructions for execution by the controller or any suitable processor. The same or separate storage can be used for images or data, a removable memory can be available for sharing information with other devices, and any number of communication approaches can be available for sharing with other devices. In addition, as shown, the computing system **1100** includes the display **130**, which may be a touch screen, organic light emitting diode (OLED), or liquid crystal display (LCD), although devices might convey information via other means, such as through audio speakers, projectors, or casting the display or streaming data to another device, such as a mobile phone, wherein an application on the mobile phone displays the data.

[0111] The computing system **1100** also includes the energy storage device **150**, which is operable to be recharged through conventional plug-in approaches. In some embodiments, the computing system **1100** can also include at least one additional I/O device **1110** able to receive conventional input from a user. This conventional input can include, for example, a push button, touch pad, touch screen, wheel, joystick, keyboard, mouse, keypad, or any other such device or element whereby a user can input a command to the computing system **1100**. In some embodiments, the I/O device(s) **1110** can be connected by a wireless infrared or Bluetooth or other link as well in some embodiments. In some embodiments, the computing system **1100** can include a microphone or other audio capture element that accepts voice or other audio commands. In some embodiments, the I/O device(s) **1110** can include one or more electrodes, optical sensors, barometric sensors (e.g., altimeter, etc.), and the like.

[0112] The computing system **1100** can include one or more wireless networking components **1112** operable to communicate with one or more electronic devices within a communication range of a particular wireless channel. The wireless channel can be any appropriate channel used to enable devices to communicate wirelessly, such as Bluetooth, cellular, NFC, Ultra-Wideband (UWB), or Wi-Fi channels. It should be understood that the computing system **1100** can have one or more conventional wired communications connections as known in the art.

[0113] The computing system **1100** can include a driver **1114** and at least some combination of one or more emitters **1116** and one or more detectors **1118** for measuring data for one or more metrics of a human body, such as for a person wearing the wearable computing device **100**. In some embodiments, for example, this may involve at least one imaging element, such as one or more cameras that are able to capture images of the surrounding environment and that are able to image a user, people, or objects in the vicinity of the device. The image capture element can include any appropriate technology, such as a CCD image capture element having a sufficient resolution, focal range, and viewable area to capture an image of the user when the user is operating the device. Further image capture elements may also include depth sensors. Methods for capturing images using a camera element with a computing device are well known in the art and will not be discussed herein in detail. It should be understood that image capture can be performed using a single image, multiple images, periodic imaging, continuous image capturing, image streaming, etc. Further, the computing system **1100** can include the ability to start and/or stop image capture, such as when receiving a command from a user, application, or other device.

[0114] The emitters **1116** and the detectors **1118** may also be capable of being used, in one example, for obtaining optical photoplethysmogram (PPG) measurements. Some PPG technologies rely on detecting light at a single spatial location, or adding signals taken from two or more spatial locations. Both of these approaches result in a single spatial measurement from which the heart rate (HR) estimate (or other physiological metrics) can be determined. In some embodiments, a PPG device employs a single light source coupled to a single detector (i.e., a single light path). Alternatively, a PPG device may employ multiple light sources coupled to a single detector or multiple detectors (i.e., two or more light paths). In other embodiments, a PPG device employs multiple detectors coupled to a single light source or multiple light sources (i.e., two or more light paths). In some cases, the light source(s) may be configured to emit one or more of green, red, infrared (IR) light, as well as any other suitable wavelengths in the spectrum (such as long IR for metabolic monitoring). For example, a PPG device may employ a single light source and two or more light detectors each configured to detect a specific wavelength or wavelength range. In some cases, each detector is configured to detect a different wavelength or wavelength range from one another. In other cases, two or more detectors are configured to detect the same wavelength or wavelength range. In yet another case, one or more detectors configured to detect a specific wavelength or wavelength range different from one or more other detectors). In embodiments employing multiple light paths, the PPG device may determine an average of the signals resulting from the multiple light paths before determining an HR estimate or other physiological metrics.

[0115] Moreover, in an embodiment, the emitters **1116** and detectors **1118** may be coupled to the controller **1102** directly or indirectly using driver circuitry by which the controller **1102** may drive the emitters **1116** and obtain signals from the detectors **1118**. The host computer **1122** can communicate with the wireless networking components **1112** via the one or more networks **1120**, which may include one or more local area networks, wide area networks, UWB, and/or internetworks using any of terrestrial or satellite links. In some embodiments, the host computer **1122** executes control programs and/or application.

[0116] While the present subject matter has been described in detail with respect to various specific example embodiments thereof, each example is provided by way of explanation, not limitation of the disclosure. Those skilled in the art, upon attaining an understanding of the foregoing, can readily produce alterations to, variations of, and equivalents to such embodiments. Accordingly, the subject disclosure does not preclude inclusion of such modifications, variations and/or additions to the present subject matter as would be readily apparent to one of ordinary skill in the art. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that the present disclosure cover such alterations, variations, and equivalents.

What is claimed is:

1. A wearable computing device comprising:

a housing;

an energy storage device;

a power interface configured to deliver electrical power from the energy storage device to a circuit included on a band that is removably coupled to the housing;

a switching device configured to selectively couple the energy storage device to the power interface; and

a processor configured to:

control operation of the switching device to couple the energy storage device to the power interface to deliver the electrical power to the circuit included on the band;

obtain data from the circuit on the band that is indicative of a unique identifier for the band; and

control operation of the wearable computing device based, at least in part, on the data indicative of the unique identifier for the band.

2. The wearable computing device of claim **1**, wherein the power interface includes a first conductor for power and a second conductor for electrical ground.

3. The wearable computing device of claim **2**, wherein the processor is configured to obtain the data indicative of the unique identifier via the first conductor of the power interface.

4. The wearable computing device of claim **1**, wherein:

the wearable computing device includes one or more sensors; and

the processor is further configured to determine whether the wearable computing device is being worn by a user based, at least in part, on the data from the one or more sensors.

5. The wearable computing device of claim **4**, wherein the one or more sensors include a heart rate sensor and the data includes heart rate data.

6. The wearable computing device of claim **4**, wherein the processor is configured to control operation of the switching device to electrically couple the energy storage device to the power interface in response to determining the wearable computing device is not being worn by the user.

7. The wearable computing device of claim **1**, wherein the processor is further configured to:

in response to obtaining the data indicative of the unique identifier for the band, control operation of the switching device to decouple the energy storage device from the power interface to cease delivery of the electrical power to the circuit included on the band.

8. The wearable computing device of claim **1**, wherein the unique identifier identifies one or more features of the band.

9. The wearable computing device of claim **8**, wherein the one or more features include at least one of a material of the band or a color of the band.

10. The wearable computing device of claim **8**, wherein the unique identifier is indicative of one or more sensors included on the band.

11. The wearable computing device of claim **10**, wherein:

to control operation of the wearable computing device, the processor is configured to obtain data from the one or more sensors on the band.

12. The wearable computing device of claim **11**, wherein the processor is configured to obtain the data from the one or more sensors on the band via the power interface.

13. A method for identifying a band coupled to a housing of a wearable computing device, the method comprising:

controlling, via a processor of the wearable computing device, a switching device of the wearable computing device to electrically couple an energy storage device of the wearable computing device to a power interface of the wearable computing device to transfer electrical power from the energy storage device to a circuit included on the band coupled to the housing of the wearable computing device;

obtaining, via the processor, data indicative of a unique identifier for the band from the circuit on the band; and

controlling, via the processor, operation of the wearable computing device based, at least in part, on the unique identifier for the band.

14. The method of claim **13**, further comprising:

determining, via a processor of the wearable computing device, the wearable computing device is not being worn by a user; and

controlling the switching device of the wearable computing device to electrically couple the energy storage device of the wearable computing device to the power interface of the wearable computing device to transfer electrical power from the energy storage device to the circuit included on the band coupled to the housing of the wearable computing device occurs in response to determining the wearable computing device is not being worn by the user.

15. The method of claim **14**, wherein determining the wearable computing device is not being worn by the user includes:

obtaining data from one or more sensors of the wearable computing device; and

determining the band is coupled to the housing of the wearable computing device based, at least in part, on the data from the one or more sensors.

16. The method of claim **15**, wherein the one or more sensors include a heart rate sensor or a motion sensor.

17. The method of claim **13**, wherein obtaining the unique identifier for the band includes obtaining, via the processor, the unique identifier from the circuit on the band via the power interface.

18. The method of claim **13**, further comprising:

in response to obtaining the data indicative of the unique identifier for the band, controlling operation of the switching device to electrically decouple the energy storage device from the power interface to cease transfer of electrical power from the energy storage device to the circuit included on the band.

19. The method of claim **13**, wherein controlling operation of the wearable computing device includes controlling, via the processor, operation of an electronic output device of the wearable computing device.

20. The method of claim **19**, wherein:

the electronic output device include a display screen;

the unique identifier indicates a color of the band; and

controlling operation of the display screen includes adjusting a color of at least a portion of the display screen based, at least in part, on the color of the band.

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