

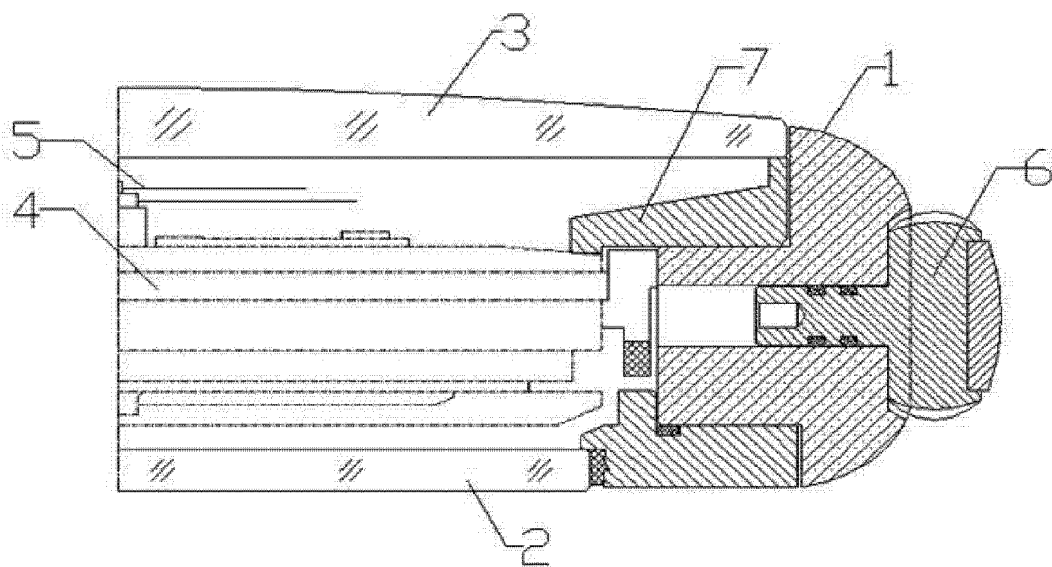


图 1

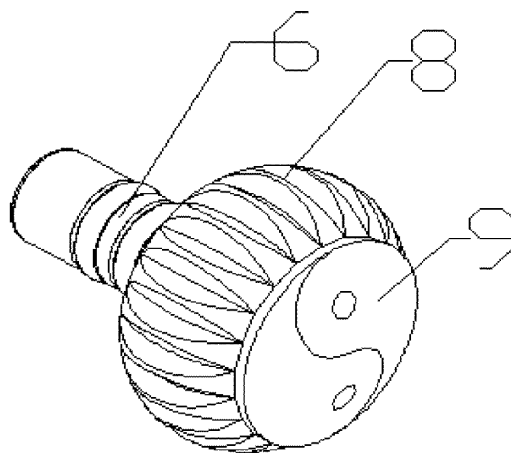


图 2



Espacenet

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Jade and gem watch

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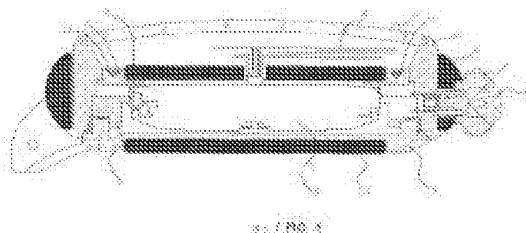
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Abstract of CN202710937 (U)

A jade and gem watch includes a stainless steel watchcase (1), a stainless steel watch bottom (2), a movement (3) arranged within the stainless steel watchcase (1), watch hands (4) arranged on the movement (3), a dial plate (5) arranged between the watch hands (4) and the movement (3), a stainless steel fixing hood (6) which is arranged inside the watchcase and is used for fixing the movement (3), a stainless steel watch crown (7) connected to the watchcase (1), and coaxial jade rings (8) embedded at the outer circumference of the watchcase (1). A watch bottom jade sheet (9) is embedded inside the stainless steel watch bottom (2); a dial plate jade sheet (10) is arranged inside the dial plate (5); the edge of a gem watch cover (11) is arranged on an inlay stage of an inner surface of an upper end of the stainless steel watchcase (1); the gem watch cover (11) and the stainless steel watchcase (1) form a closed space; and gems are embedded at an tail end of the stainless steel watch crown (7). The jade and gem watch is advantageous in favorable decorative effect and great health care effect.





(12) 实用新型专利

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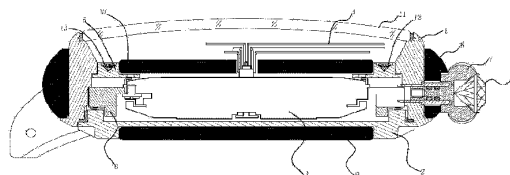
权利要求书 1 页 说明书 2 页 附图 1 页

(54) 实用新型名称

一种玉石手表

(57) 摘要

一种玉石手表,包括不锈钢表壳(1)、不锈钢表底(2)、设于不锈钢表壳(1)内的机芯(3)、设于机芯(3)上的表针(4)、设于表针(4)与机芯(3)之间的表盘(5)、设于表壳(1)内用于固定机芯(3)的不锈钢固机罩(6)、和与表壳(1)相连接的不锈钢表冠(7)、所述表壳(1)的外圆周上嵌设有同轴的玉圈(8),不锈钢表底(2)内嵌设有表底玉片(9),表盘(5)内设有表盘玉片(10),一宝石表盖(11)的边缘设于不锈钢表壳(1)上端的内表面的镶嵌台上,所述宝石表盖(11)与不锈钢表壳(1)形成封闭空间,所述不锈钢表冠(7)的末端镶嵌有宝石(12)。该玉石手表具有较好的装饰效果及保健作用。



1. 一种玉石手表,包括不锈钢表壳、不锈钢表底,设于不锈钢表壳内的机芯,设于机芯上的表针,设于表针与机芯之间的表盘,设于表壳内用于固定机芯的不锈钢固机罩,与表壳相连接的不锈钢表冠,其特征在于,所述表壳的外圆周上嵌设有同轴的玉圈,不锈钢表底内嵌设有表底玉片,表盘内设有表盘玉片,一宝石表盖的边缘设于不锈钢表壳的上端的内表面的镶嵌台上,所述宝石表盖与不锈钢表壳形成封闭空间,所述不锈钢表冠的末端镶嵌有宝石。

2. 如权利要求 1 所述的一种玉石手表,其特征在于,所述宝石表盖由蓝宝石制成。

3. 如权利要求 1 所述的一种玉石手表,其特征在于,所述不锈钢表冠末端镶嵌的宝石为红宝石。

4. 如权利要求 1 所述的一种玉石手表,其特征在于,所述表底玉片、表盘玉片、玉圈由玉石或翡翠或宝石制成。

5. 如权利要求 1 所述的一种玉石手表,其特征在于,所述表盘的两端靠近端部的上表面内均嵌设有宝石,所述宝石的顶部表面位于表盘的嵌设宝石的下沉座内。

一种玉石手表

技术领域

[0001] 本实用新型涉及一种手表,尤其涉及一种采用玉石为材料制成的手表。

背景技术

[0002] 作为一种计时工具,手表得到了广泛的运用,同时,也作为一种身份和财富的象征,奢侈、豪华型手表得到了达官贵人的青睐,无论是作为普通的计时工具还是奢侈品,手表大都采用金属作为材料制成,即使是用于彰显身份的奢侈型手表相对于普通手表而言,也是采用金属材料制成,只是做工更精细,并镶嵌贵重金属而已,但这类手表除了作为看看时间的工具和彰显身份外,对人体并无任何益处。

实用新型内容

[0003] 本实用新型的主要目的在于提供一种与人体接触的部位采用玉石材料制成,具有装饰及保健功能玉石手表。

[0004] 为了达到上述目的,本实用新型所采用的技术方案为:一种玉石手表,包括不锈钢表壳、不锈钢表底,设于不锈钢表壳内的机芯,设于机芯上的表针,设于表针与机芯之间的表盘,设于表壳内用于固定机芯的不锈钢固机罩,与表壳相连接的不锈钢表冠,所述表壳的外圆周上嵌设有同轴的玉圈,不锈钢表底内嵌设有表底玉片,表盘内设有表盘玉片,一宝石表盖的边缘设于不锈钢表壳的上端的内表面的镶嵌台上,所述宝石表盖与不锈钢表壳形成封闭空间,所述不锈钢表冠的末端镶嵌有宝石。

[0005] 优选地,所述宝石表盖由蓝宝石制成。

[0006] 优选地,所述不锈钢表冠末端镶嵌的宝石为红宝石。

[0007] 优选地,所述表底玉片、表盘玉片、玉圈由玉石或翡翠或宝石制成。

[0008] 优选地,所述表盘的两端靠近端部的上表面内均嵌设有宝石,所述宝石的顶部表面位于表盘 5 的嵌设宝石的下沉座内。

[0009] 采用上述结构后,在与人体接触的部位以及显眼的位置均采用玉石材料制成,具有强烈的玉石质感,因此具备良好的装饰作用,而且,玉石本身对人体具有保健作用,因此本实用新型具有较好的装饰效果及保健作用。

附图说明

[0010] 图 1 为本实用新型的剖视图。

具体实施方式

[0011] 为了使本实用新型的目的、技术方案及优点更加清楚明白,以下结合附图及实施例,对本实用新型进行进一步详细说明。应当理解,此处所描述的具体实施例仅仅用以解释本实用新型,并不用于限定本实用新型。

[0012] 请参考图 1 所示,本实用新型公开了一种玉石手表,包括不锈钢表壳 1、不锈钢表

底 2, 设于不锈钢表壳 1 内的机芯 3, 设于机芯 3 上的表针 4, 设于表针 4 与机芯 3 之间的表盘 5, 设于表壳 1 内用于固定机芯 3 的不锈钢固机罩 6, 与表壳 1 相连接的不锈钢表冠 7。

[0013] 所述表壳 1 的外圆周上嵌设有同轴的玉圈 8, 不锈钢表底 2 内嵌设有表底玉片 9, 作为腕表使用时, 则表底玉片 9 刚好与人体皮肤相接触, 表盘 5 内设有表盘玉片 10, 一宝石表盖 11 的边缘设于不锈钢表壳 1 的上端的内表面的镶嵌台上并固定在不锈钢表壳 1 上, 所述宝石表盖 11 与不锈钢表壳 1 形成封闭空间, 所述不锈钢表冠 7 的末端镶嵌有宝石 12。

[0014] 在本实施例中, 所述宝石表盖 11 由蓝宝石制成。

[0015] 在本实施例中, 所述不锈钢表冠 7 末端镶嵌的宝石 12 为红宝石。

[0016] 在本实施例中, 所述表底玉片 9、表盘玉片 10、玉圈 8 均由玉石制成, 但采用翡翠或宝石等类似质地的材料均可以达到玉石的效果, 而且生产的工艺基本一致。

[0017] 所述表盘 5 的两端靠近端部的上表面内均嵌设有宝石 13, 所述宝石 13 的顶部表面位于表盘 5 的嵌设宝石的下沉座内, 透过透明的宝石表盖 11 可以看到宝石 13 的顶部表面, 从而减少了玉石手表的金属质感, 增强玉石或宝石之感。

[0018] 以上所述, 仅为本实用新型较佳的具体实施方式, 但本新型的保护范围并不局限于此, 任何熟悉本技术领域的技术人员在本实用新型揭露的技术范围内, 可轻易想到的变化或替换, 都应涵盖在本实用新型的保护范围之内。因此, 本新型的保护范围应该以权利要求要求的保护范围为准。

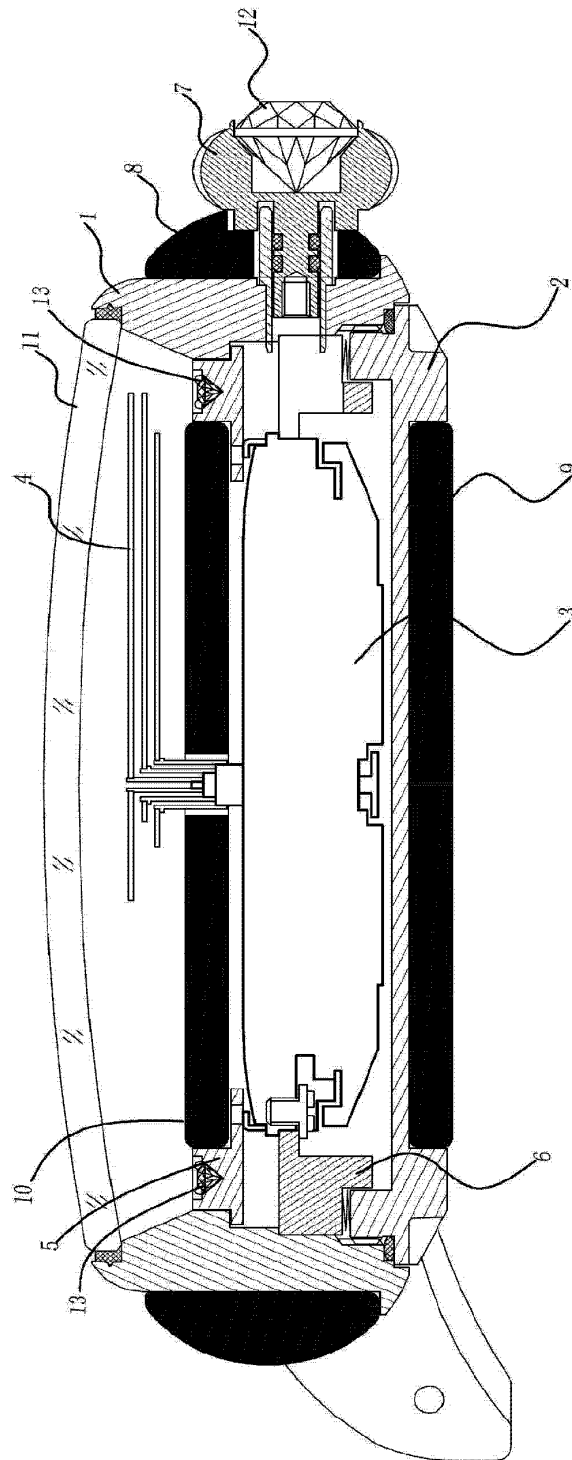


图 1

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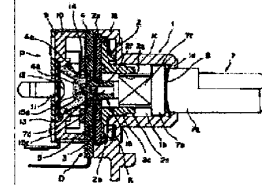
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(71)Applicant ALPS ELECTRIC CO LTD
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KAWASAKI KENZO



(54)ROTARY ELECTRIC PART HAVING PUSHING SWITCH

(57)Abstract

PROBLEM TO BE SOLVED: To obtain a stabilized clicking sense by providing the constitution, wherein a rubber member and a coupling member are bonded by the concave and convex pattern.

SOLUTION: When an operating shaft 7 is rotated in a rotary electric part with a pushing switch, a movable contact point 3 is connected to and separated from a fixed contact point 4 by the rotation of a rotary body 2, and a rotary electric part D is operated. Furthermore, when the operating shaft 7 is pushed and moved to the direction of the shaft, the operating shaft 7 moves a coupling member 15 to the axial direction. At the same time, the coupling member 15 pushes the flat surface of a rubber member 13 at the flat surfaces of a convex part 15d and an extending part 15c. Then, the rubber member 13 is pushed, deformed and inverted. A movable contact point 12 is brought into contact with the fixed contact point 11 by the clicking action of the rubber member 13, and ON-state is provided. When the pushing of the operating shaft 7 is released from this state, the coupling member 15 and the operating shaft 7 are pushed back by the rubber member 13. The movement of a collar part 7b of the operating shaft 7 is stopped by the collar part 1d. When an extending part 15c of the coupling member 15 is held at a

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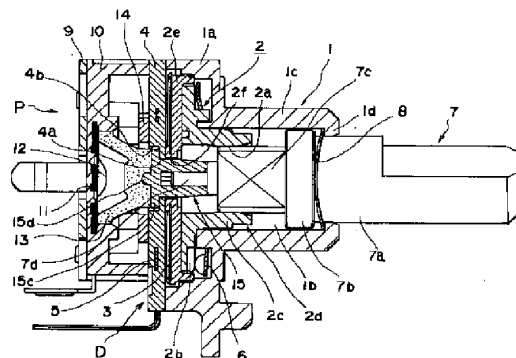
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(54) 【発明の名称】 プッシュスイッチ付回転型電気部品

(57) 【要約】

【課題】 従来のプッシュスイッチ付回転型電気部品は、ゴム部材41の頂部と操作軸35の突部35dとが単に当接関係であるため、取付のバラツキ等により軸方向におけるゴム部材41と突部35dとの位置を一定にすることが出来ず、従って、突部35dのゴム部材41への押圧位置が一定せず、クリック感にバラツキが生じるという問題がある。

【解決手段】 本発明のプッシュスイッチ付回転型電気部品は、ゴム部材13と連結部材15とを凹凸結合したものであるため、ゴム部材13と連結部材15との位置を一定に出来て、連結部材15のゴム部材13への押圧位置が一定となり、安定したクリック感を得ることが出来るプッシュスイッチ付回転型電気部品を提供できる。



【特許請求の範囲】

【請求項 1】 孔を設けた回転体を有する回転型電気部品と、該回転型電気部品の後部に配設され、可動接点と固定接点、及び前記可動接点を動作するための腕状のゴム部材とを有するプッシュスイッチと、前記回転体の前記孔に挿通された操作軸と、該操作軸と前記ゴム部材との間に介在され、前記操作軸の移動を前記ゴム部材に伝達する連結部材とを備え、前記操作軸の端部に設けた係合部と前記連結部材の係合部とが嵌合結合されると共に、前記連結部材と前記ゴム部材の一方には凹部、他方には凸部が設けられて互いに凹凸結合され、前記前記操作軸の回転動作で、前記回転体を回転させて前記回転型電気部品を操作すると共に、前記操作軸の軸方向の移動動作で、前記連結部材を介してゴム部材を可動して前記プッシュスイッチを操作するようにしたことを特徴とするプッシュスイッチ付回転型電気部品。

【請求項 2】 前記操作軸の軸線上に、前記操作軸と前記連結部材の係合部、及び前記連結部材と前記ゴム部材の凹部と凸部とを設けたことを特徴とする請求項 1 記載のプッシュスイッチ付回転型電気部品。

【請求項 3】 腕状の前記ゴム部材の平坦面をなす頂部に前記凹部、或いは前記凸部を設け、また、前記ゴム部材の頂部と対向する前記連結部材の対向面を平坦面となし、前記ゴム部材の平坦面と前記連結部材の平坦面とを当接した状態で互いに凹凸結合させたことを特徴とする請求項 1、又は 2 記載のプッシュスイッチ付回転型電気部品。

【請求項 4】 前記連結部材には、前記平坦面を有する張り出し部を設け、取付基体に設けた収納部で前記張り出し部を保持可能にしたことを特徴とする請求項 3 記載のプッシュスイッチ付回転型電気部品。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、操作軸の軸方向の移動動作で接点を ON、OFF させるプッシュスイッチを備え、操作軸の回転動作によりパルススイッチ、或いは可変抵抗器等の回転型電気部品を操作するようにしたプッシュスイッチ付回転型電気部品に関する。

【0002】

【従来の技術】従来のこの種のプッシュスイッチ付回転型電気部品は、図 4 に示すように、軸受け 31 は、収納部 31a と、貫通孔 31b と、端部に貫通孔 31b の一部を塞ぐように設けられた鏝部 31c を有している。また、軸受け 31 の収納部 31a 内には、中心部に孔 32a を有する回転可能な磁気ドラム 32 と、磁気ドラム 32 に対向した位置に固定された複数個のホール IC 33 とが収納され、磁気ドラム 32 とホール IC 33 とでロータリエンコーダである回転型電気部品 D が構成されている。

【0003】また、磁気ドラム 32 には、凹凸部 32b

が設けられ、収納部 31a 内に固定されたバネ 34 が凹凸部 32b に係脱可能になっていて、磁気ドラム 32 の回転時、クリック動作を行うことが出来るようになっていて。また、操作軸 35 は、溝 35a を有する円形部 35b と、円形部 35b に繋がる非円形部 35c と、非円形部 35c に繋がる突部 35d とを有し、この操作軸 35 は、軸受け 31 の貫通孔 31b と磁気ドラム 32 の孔 32a に挿通され、円形部 35b が鏝部 31c に、また、非円形部 35c が孔 32a に位置した状態と成っている。そして、操作軸 35 の溝 35a には、金属製のワッシャー 36 が取り付けられて、ワッシャー 36 が鏝部 31c の内面と当接するようにして、操作軸 35 の抜け止めを行っている。また、このようにして取り付けられた操作軸 35 は、回転動作と軸方向の移動動作が可能で、操作軸 35 を回転すると、円形部 35b が鏝部 31c をガイドにして回転すると共に、非円形部 35c によって磁気ドラム 32 を回転し、また、操作軸 35 を軸方向に移動すると、鏝部 31c と孔 32a との間でスライドして移動するようになっている。

【0004】また、合成樹脂の成型品から成る絶縁基体 37 は、軸受け 31 の収納部 31a の開放部を覆うように配設され、この絶縁基体 37 の凹部 37a 内には、プッシュスイッチ P が取り付けられている。そして、このプッシュスイッチ P は、ケース 38 に埋設された固定接点 39 と、ケース 38 内に配設された可動接点 40 と、ケース 38 内に設けられ、可動接点 40 を覆うように配設されたドーム状のゴム部材 41 と、ケース 38 の開放部を覆うように配設された板部 42 とで構成されている。そして、プッシュスイッチ P が回転型電気部品 D の後部に取り付けられた際、ゴム部材 41 の頂部は、操作軸 35 の突部 35d と当接した状態にあって、操作軸 35 を前方に押し圧するようになっている。

【0005】このようなプッシュスイッチ付回転型電気部品において、操作軸 35 に取り付けられたツマミ 43 を回転すると、操作軸 35 によって磁気ドラム 32 がクリック動作を行いながら回転し、この磁気ドラム 32 の回転によってホール IC 33 が出力信号を発生して、回転型電気部品 D が操作される。また、ツマミ 43 を軸方向に押し圧して移動すると、操作軸 35 も移動して、突部 35d でゴム部材 41 を押圧する。すると、ゴム部材 41 が押されて変形して反転し、ゴム部材 41 のクリック動作で可動接点 40 を押圧して、可動接点 40 が固定接点 39 に接触して ON となる。そして、ツマミ 43 の押し圧を解除すると、ゴム部材 41 は自己のバネ性により元の状態に反転復帰するため、操作軸 35 はゴム部材 41 によって押し戻されて、ワッシャー 36 が鏝部 31c に係止されると共に、可動接点 40 は自己のバネ性により元の状態に復帰して OFF の状態となる。このようにして、回転型電気部品 D とプッシュスイッチ P の操作が行われるものである。

【0006】

【発明が解決しようとする課題】従来のプッシュスイッチ付回転型電気部品は、ゴム部材 4 1 の頂部と操作軸 3 5 の突部 3 5 d とが単に当接関係であるため、取付のパラツキ等により軸方向におけるゴム部材 4 1 と突部 3 5 d との位置を一定にすることが出来ず、従って、突部 3 5 d のゴム部材 4 1 への押圧位置が一定せず、クリック感にパラツキが生じるという問題がある。また、操作軸 3 5 の軸心上で、ゴム部材 4 1 の中心部を押圧された時が最良のクリック感となるが、突部 3 5 d のゴム部材 4 1 への押圧位置が一定しないため、良好なクリック感を得ることが出来ないという問題がある。また、突部 3 5 d の先端部とゴム部材 4 1 が当接関係であるため、振動、或いは突部 3 5 d の押圧時、突部 3 5 d とゴム部材 4 1 との間に摺動が生じ、ゴム部材 4 1 の寿命が短いという問題がある。また、突部 3 5 d の押圧時、ゴム部材 4 1 との間の摺動により、突部 3 5 d の先端部がゴム部材 4 1 の中心部からずれて押圧位置が変わり、クリック感が悪くなるという問題がある。また、突部 3 5 d でゴム部材 4 1 を押圧するため、一点による押圧となり、ゴム部材 4 1 の変形が安定せず、クリック感にパラツキが生じるという問題がある。

【0007】

【課題を解決するための手段】上記課題を解決するための第 1 の解決手段として、孔を設けた回転体を有する回転型電気部品と、該回転型電気部品の後部に配設され、可動接点と固定接点、及び前記可動接点を動作するための腕状のゴム部材とを有するプッシュスイッチと、前記回転体の前記孔に挿通された操作軸と、該操作軸と前記ゴム部材との間に介在され、前記操作軸の移動を前記ゴム部材に伝達する連結部材とを備え、前記操作軸の端部に設けた係合部と前記連結部材の係合部とが嵌合結合されると共に、前記連結部材と前記ゴム部材の一方には凹部、他方には凸部が設けられて互いに凹凸結合され、前記前記操作軸の回転動作で、前記回転体を回転させて前記回転型電気部品を操作すると共に、前記操作軸の軸方向の移動動作で、前記連結部材を介してゴム部材を可動して前記プッシュスイッチを操作するようにした構成とした。また、第 2 の解決手段として、前記操作軸の軸線上に、前記操作軸と前記連結部材の係合部、及び前記連結部材と前記ゴム部材の凹部と凸部とを設けた構成とした。また、第 3 の解決手段として、腕状の前記ゴム部材の平坦面をなす頂部に前記凹部、或いは前記凸部を設け、また、前記ゴム部材の頂部と対向する前記連結部材の対向面を平坦面となし、前記ゴム部材の平坦面と前記連結部材の平坦面とを当接した状態で互いに凹凸結合させた構成とした。また、第 4 の解決手段として、前記連結部材には、前記平坦面を有する張り出し部を設け、取付基体に設けた収納部で前記張り出し部を保持可能にした構成とした。

【0008】

【発明の実施の形態】本発明のプッシュスイッチ付回転型電気部品を図 1 ～図 3 に基づいて説明すると、図 1 は本発明のプッシュスイッチ付回転型電気部品の断面図、図 2 は本発明のプッシュスイッチ付回転型電気部品の要部の分解斜視図、図 3 は本発明のプッシュスイッチ付回転型電気部品の動作を示す説明図である。

【0009】そして、本発明のプッシュスイッチ付回転型電気部品は、図 1 ～図 3 に示すように、亜鉛ダイキャスト等から成る軸受け 1 は、収納部 1 a と、貫通孔 1 b を筒部 1 c と、筒部 1 c の端部に貫通孔 1 b の一部を塞ぐように設けられた鏝部 1 d を有している。また、軸受け 1 の収納部 1 a 内には、中心部に非円形状の孔 2 a を有する回転可能な回転体 2 が配設され、この回転体 2 は、凹凸部 2 b と筒状部 2 c とを有する金属から成る保持部 2 d と、保持部 2 d に結合された合成樹脂から成る絶縁部材 2 e と、絶縁部材 2 e に取り付けられた金属板から成る可動接点 3 とで構成され、そして、この回転体 2 の筒状部 2 c は、軸受け 1 の貫通孔 1 b 内に挿入されて、軸受け 1 をガイドにして回転するようになっている。また、合成樹脂の成型品から成る取付基体 4 には、固定接点 5 が埋設され、この取付基体 4 は、軸受け 1 の収納部 1 a の開放部を覆うように配設されて軸受け 1 に取り付けられている。そして、取付基体 4 が取り付けられた際、固定接点 5 の弾性接点（図示せず）が可動接点 3 に接離して接点の切り換えが行われるもので、可動接点 3 を有する回転体 2 と固定接点 5 を有する取付基体 4 とでパルススイッチである回転型電気部品 D が構成されている。なお、回転型電気部品 D は、エンコーダ、可変抵抗器等でも良い。

【0010】また、軸受け 1 の収納部 1 a 内には、金属板から成るバネ 6 が固定され、このバネ 6 が回転体 2 の凹凸部 2 b に係脱可能になっていて、回転体 2 の回転時、クリック動作を行うことが出来るようになっている。また、金属等から成る操作軸 7 は、操作部 7 a と、操作部 7 a より大径の円形から成る鏝部 7 b と、鏝部 7 b に繋がって設けられた非円形部 7 c と、非円形部 7 c に繋がって軸心部に設けられた円柱状の係合部 7 d とを有している。そして、この操作軸 7 は、軸受け 1 の貫通孔 1 b と回転体 2 の孔 2 a に挿通され、操作部 7 a が鏝部 1 d に、また、鏝部 7 b が貫通孔 1 b に、更に、非円形部 7 c が孔 2 a に位置した状態と成っていて、操作軸 7 は、鏝部 1 d による操作部 7 a の支持で回転すると共に、軸方向の移動を行い、そして、操作軸 7 は、鏝部 7 b が軸受け 1 の鏝部 1 d に係合可能になって、軸受け 1 からの抜け防止を行っている。また、バネ性ある金属板を湾曲して形成された弾性部材 8 は、操作軸 7 の操作部 7 a に挿通されて、軸受け 1 の鏝部 1 d と操作軸 7 の鏝部 7 b との間に配置されて取り付けられている。そして、この弾性部材 8 は、操作軸 7 を常時後方に弾圧する

と共に、操作軸 7 が前方に押し戻された際、鏢部 7 b の鏢部 1 d への衝突を防ぐと共に、弾性部材 8 の鏢部 1 d への衝突を和らげ、衝突音を少なくしている。

【0011】また、回転型電気部品 D の後部には、取付板 9 によってプッシュスイッチ P が取り付けられ、このプッシュスイッチ P は、合成樹脂の成型品から成るケース 10 に埋設された固定接点 11 と、ケース 10 内に配設された可動接点 12 と、ケース 10 内に配置され、可動接点 12 を覆うように配設された碗状のゴム部材 13 と、ゴム部材 13 の抜け止めをなす板部 14 とで構成されている。また、前記ゴム部材 13 は、碗状の頂部が平坦面となっており、その中心部、即ち、操作軸 7 の軸心部と一直線上の位置に凹部 13 a が形成されており、プッシュスイッチ P が回転型電気部品 D の後部に取り付けられた際、ゴム部材 13 は、操作軸 7 の係合部 7 d と一直線上の位置で配置されるようになっている。

【0012】また、合成樹脂の成型品等から成る連結部材 15 は、孔から成る係合部 15 a を有する略円錐形状の基部 15 b と、基部 15 b の一端から張り出した平坦面を有する張り出し部 15 c と、張り出し部 15 c の中心部に設けられた凸部 15 d とで構成されている。そして、この連結部材 15 は、基部 15 b が取付基体 4 の孔 4 a と回転体 2 の絶縁部材 2 e の孔 2 f に挿通されて、係合部 15 a である孔に、操作軸 7 の係合部 7 d を嵌入（嵌合結合）すると共に、凸部 15 d をゴム部材 13 の凹部 13 a に嵌合（凹凸結合）した状態で、張り出し部 15 c の平坦面をゴム部材 13 の頂部の平坦面に当接させ、且つ、張り出し部 15 c を取付基体 4 の凹部から成る収納部 4 b に収納、保持することにより取り付けられている。そして、このようにして取り付けられた連結部材 15 は、係合部 15 a、及び凸部 15 d が操作軸 7 の軸心線 S 上に位置して配置されると共に、連結部材 15 は、ゴム部材 13 で押圧されて取付基体 4 に当接して収納部 4 b に保持され、また、操作軸 7 は、この連結部材 15 で前方に押圧されている。また、鏢部 1 d の孔、及び円筒部 2 a と貫通孔 1 b の当接部等、金属同志が摺動する箇所には、図示しないグリスが塗布されている。

【0013】このようなプッシュスイッチ付回転型電気部品において、図 1 の状態で操作軸 7 を回転すると、操作軸 7 は、操作部 7 a が鏢部 1 d をガイドすると共に、操作軸 7 に一体に取り付けられた連結部材 15 の基部 15 b の根本部分が取付基体 4 の孔 4 a にガイドされ、2 点支持された状態で回転し、操作軸 7 によって回転体 2 がクリック動作を行いながら回転する。そして、回転体 2 の回転で可動接点 3 が回転して、可動接点 3 が固定接点 4 と接離して接点の切り換えが行われて、回転型電気部品 D が操作される。また、図 1 の状態で操作軸 7 を軸方向に押し圧して移動すると、操作部 7 a が鏢部 1 d、及び非円形部 7 c が孔 2 a をガイドにして移動して、操作軸 7 は、連結部材 15 を軸方向に移動すると共に、連

結部材 15 は凸部 15 d と張り出し部 15 c の平坦面でゴム部材 13 の平坦面を押圧する。すると、図 3 に示すように、ゴム部材 13 が押されて変形して反転し、ゴム部材 13 のクリック動作で可動接点 12 を押圧して、可動接点 12 が固定接点 11 に接触して ON となる。そして、この状態から操作軸 7 の押し圧を解除すると、ゴム部材 13 は自己のバネ性により元の状態に反転復帰するため、連結部材 15 と操作軸 7 はゴム部材 13 によって押し戻される。この時、操作軸 7 の鏢部 7 b と軸受け 1 の鏢部 1 d との間に介在したバネ部材 8 によって、操作軸 7 の戻りの衝撃が和らげられ、衝突音が極めて少なくなる。また、この際、基部 15 b は略円錐形状であり、先端が細くなっているため孔 4 a に引っかかることはない。そして、操作軸 7 の鏢部 7 b が鏢部 1 d によって移動が停止し、且つ、連結部材 15 の張り出し部 15 c が取付基体 4 の収納部 4 b に保持されて移動が停止すると、可動接点 12 は自己のバネ性により元の状態に復帰して OFF の状態となって、図 1 の状態に戻る。このようにして、回転型電気部品 D とプッシュスイッチ P の操作が行われるものである。また、本実施例においては、操作部 7 a が鏢部 1 d をガイドにしているから、他方のガイド部との距離を長くできるが、鏢部 7 b を筒部 1 c にガイドとして当接位置にグリスを塗布しても良い。その場合、大きな径での支持回転となるため、円滑な安定した操作感触を得ることが出来る。なお、上記実施例におけるゴム部材 13 と連結部材 15 の凹部 13 a と凸部 15 d との関係を逆にし、ゴム部材 13 には凸部を、また、連結部材 15 には凹部を設けても良い。

【0014】

【発明の効果】本発明のプッシュスイッチ付回転型電気部品は、ゴム部材 13 と連結部材 15 とを凹凸結合したものであるため、ゴム部材 13 と連結部材 15 との位置を一定に出来て、連結部材 15 のゴム部材 13 への押圧位置が一定となり、安定したクリック感を得ることが出来るプッシュスイッチ付回転型電気部品を提供できる。また、ゴム部材 13 と連結部材 15 とが凹凸結合であるため、振動、或いは連結部材 15 の押圧時、連結部材 15 とゴム部材 13 との間で摺動を生じることが無く、ゴム部材 13 の摩耗のない長寿命のプッシュスイッチ付回転型電気部品を提供できる。また、ゴム部材 13 と連結部材 15 とが凹凸結合であるため、連結部材 15 の押圧時、ゴム部材 13 への押圧位置が一定となり、クリック感の安定したプッシュスイッチ付回転型電気部品を提供できる。

【0015】また、操作軸 7 の軸線 S 上に、操作軸 7 と連結部材 15 の係合部 7 d、15 a、及び連結部材 15 とゴム部材 13 の凹部 13 a と凸部 15 d とを設けたものであるため、操作軸 7 の軸線 S でゴム部材 13 を押圧することが出来、安定したクリック感の良好なプッシュスイッチ付回転型電気部品を提供できる。また、ゴム

部材 1 3 の平坦面と連結部材 1 5 の平坦面を当接させたため、連結部材 1 5 のゴム部材 1 3 への押圧が面押圧となり、ゴム部材 1 3 の変形が一定に出来て、極めてクリック感の良好なプッシュスイッチ付回転型電気部品を提供できる。また、連結部材 1 5 に設けた張り出し部 1 5 c を、取付基体 4 の収納部 4 b に収納可能にしたため、連結部材 1 5 の組立時の位置決めとなり、組立性が良好となるばかりか、連結部材 1 5 で操作軸 7 の自由端である係合部 7 d の位置決めが出来、操作軸 7 の操作性が良好で安定したプッシュスイッチ付回転型電気部品を提供できる。

【図面の簡単な説明】

【図 1】本発明のプッシュスイッチ付回転型電気部品の断面図。

【図 2】本発明のプッシュスイッチ付回転型電気部品の要部の斜視図。

【図 3】本発明のプッシュスイッチ付回転型電気部品の動作を示す説明図。

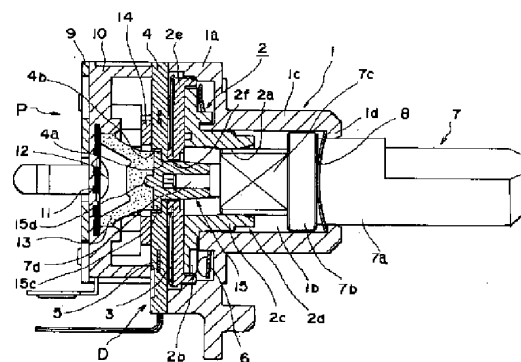
【図 4】従来のプッシュスイッチ付回転型電気部品の断面図。

【符号の説明】

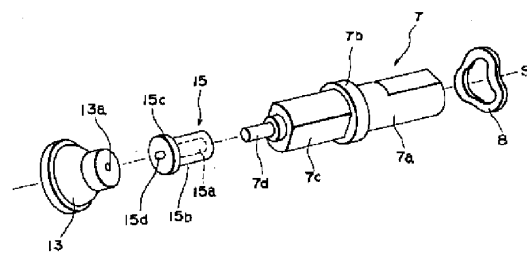
- 1 軸受け
- 1 a 収納部
- 1 b 貫通孔
- 1 c 筒部
- 1 d 鏢部
- 2 回転体
- 2 a 孔
- 2 b 凹凸部

- 2 c 筒状部
- 2 d 保持部
- 2 e 絶縁部材
- 2 f 孔
- 3 可動接点
- 4 取付基体
- 4 a 孔
- 4 b 収納部
- 5 固定接点
- 10 D 回転型電気部品
- 7 操作軸
- 7 a 操作部
- 7 b 鏢部
- 7 c 非円形部
- 7 d 係合部
- 8 弾性部材
- 9 取付板
- P プッシュスイッチ
- 1 0 ケース
- 1 1 固定接点
- 1 2 可動接点
- 1 3 ゴム部材
- 1 3 a 凹部
- 1 4 板部
- 1 5 連結部材
- 1 5 a 係合部
- 1 5 b 基部
- 1 5 c 張り出し部
- 1 5 d 凸部

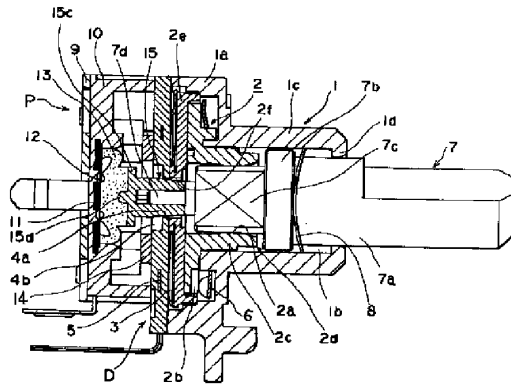
【図 1】



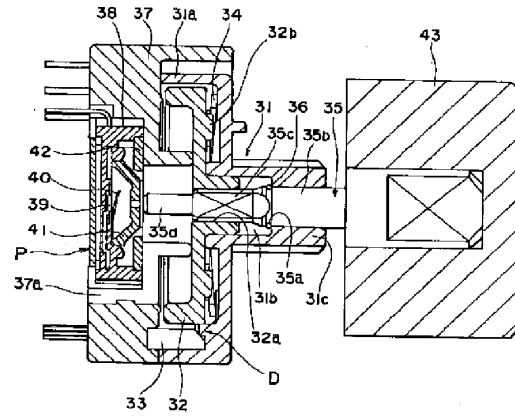
【図 2】



【図 3】



【図 4】



Electronic Acknowledgement Receipt	
EFS ID:	30192964
Application Number:	15261917
International Application Number:	
Confirmation Number:	4481
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Elissa A. Asaro
Filer Authorized By:	
Attorney Docket Number:	P22914USC3
Receipt Date:	27-AUG-2017
Filing Date:	10-SEP-2016
Time Stamp:	10:25:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P22914USC3IDS.pdf	19813	no	2
			384b75997e9fb9720adad5e4cbb44461cb2b1630		
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P22914USC3IDSFormPTOSB08a.pdf	37916 45e3c7011a5a7a6afb6343903035b96b581255f0	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	CN104880937.pdf	449802 bdeed4a5f4e1335d7bee05464bdec398abc6d8835	no	6
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4	Foreign Reference	CN202710937.pdf	440441 b447fdd0e511c9462cbef635a3d5b9674807a14e	no	6
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5	Foreign Reference	JP11121210.pdf	483297 027e7c15ba7c99f46f1146c5034da77d724b416f	no	7
Warnings:					
Information:					
Total Files Size (in bytes):			1431269		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor(s): Fletcher R. Rothkopf	
App. No.: 15/261,917	Con. No.: 4481
Filed: September 10, 2016	Art Unit: Not Yet Assigned
Title: WEARABLE ELECTRONIC DEVICE	Examiner: Not Yet Assigned

**INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§1.97(b)(3) and 1.98**

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

The Examiner is requested to consider the references noted on the enclosed Form PTO/SB/08a during examination of the above-identified patent application. These references are submitted for the Examiner's consideration and are submitted pursuant to the duty of disclosure under 37 C.F.R. § 1.56. In submitting these references, no representation is made or implied that the references are or are not material to the examination of the application. The Examiner is encouraged to make his or her own determination of materiality. Pursuant to the requirements of 37 C.F.R. § 1.98(a)(2)(ii), only copies of the foreign references are provided. Copies of the U.S. patent and U.S. patent application publication references are not provided, unless required by the Office.

This Information Disclosure Statement is being filed before the mailing date of a first Office action. Therefore, pursuant to 37 C.F.R. § 1.97(b)(3), no fees are due with respect to this filing. However, should any such fees or petitions be required, please consider this a request therefor and authorization to charge Deposit Account No. 504621 as necessary.

If the Examiner has any questions, please contact the undersigned.

Dated: August 27, 2017

Respectfully submitted,

/Elissa A. Asaro/

Elissa A. Asaro, Registration No. 64,659

Agent for Assignee

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PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>	APPLICATION NO.: 15/261,917	FILING DATE: September 10, 2016
	INVENTOR(S): Fletcher R. Rothkopf	ART UNIT: 3765
	EXAMINER NAME: Not Yet Assigned	ATTY. DOCKET NO.: P22914USC3

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No. ¹	PATENT NUMBER	ISSUE DATE	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		

U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No. ¹	PUBLICATION NUMBER	PUBLICATION DATE	Name of Inventor(s) of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		
	1.	2017/0192391	07/2017	Ely et al.	

FOREIGN PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No. ¹	DOCUMENT NUMBER	PUBLICATION DATE	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Country Code ³ – Number ⁴ – Kind Code ⁵ (if known)	MM-DD-YYYY			
	2.	CN1504843	06/2004	KS22 SA		X
	3.	CN1792295	06/2006	Li		X
	4.	CN201081979	07/2008	Tao		X
	5.	CN202008579	10/2011	Shenzhen Fiyta Holdings Ltd.		X
	6.	CN103253067	08/2013	Omega SA		X
	7.	CN203630524	06/2014	Senzhen Boshihao Jewelry Co., Ltd.		X
	8.	JP2013079961	05/2013	Peters et al.		X
	9.	WO2012/094805	07/2012	Zhao		

* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
EXAMINER INITIALS ¹	Cite No. ¹	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T ⁶
EXAMINER			DATE CONSIDERED
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¹.
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Bibliographic data: CN1504843 (A) — 2004-06-16

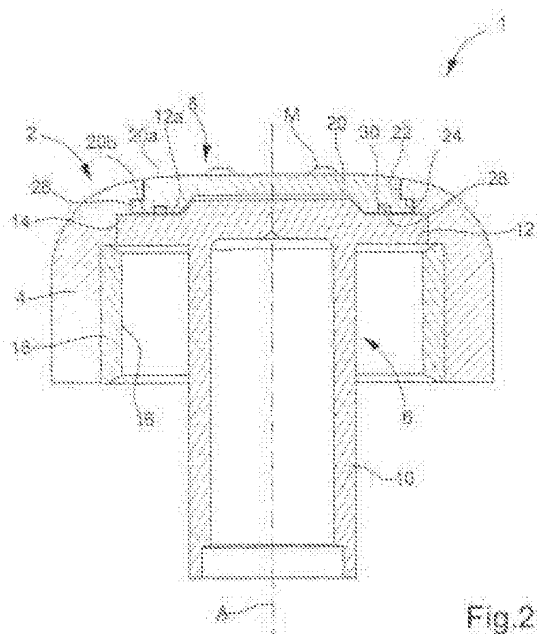
Threaded crown for timepiece

Inventor(s): SYLVAIN WENGER [CH]; ROGER ECOFFET [CH] ± (WENGER SYLVAIN, ; ECOFFET ROGER)**Applicant(s):** KS22 SA [CH] ± (KS22 SA)**Classification:** - international: G04B27/00; G04B3/04; G04B37/10;
(IPC1-7): G04B27/00; G04B29/00
- cooperative: G04B3/041; G04B37/103**Application number:** CN20031101390 20031016**Priority number (s):** EP20020079352 20021017**Also published as:** EP1411401 (A1) JP2004138613 (A) SG106158 (A1)
US2004130971 (A1)

Abstract not available for CN1504843 (A)

Abstract of corresponding document: EP1411401 (A1)

The crown screw (1) has a central part (6) which consists of a winding tube (10) and plate (12) attached to a head (2). The head may be screwed to a case tube by means of a threaded (16) ring (18). A substrata (20) which bears a logo or design (M) is held between a shoulder (24) of the head and the plate top (12a) and may be rotated against a braking ring (28) to align the logo after winding



[51] Int. Cl⁷

G04B 29/00

G04B 27/00



[12] 发明专利申请公开说明书

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[43] 公开日 2004 年 6 月 16 日

[11] 公开号 CN 1504843A

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[21] 申请号 200310101390.3

[30] 优先权

[32] 2002. 10. 17 [33] EP [31] 02079352.7

[71] 申请人 KS22 有限公司

地址 瑞士梅兰

[72] 发明人 R·埃科菲特 S·温格

[74] 专利代理机构 中国专利代理(香港)有限公司

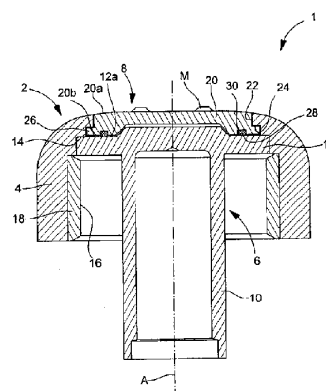
代理人 苏 娟 杨松龄

权利要求书 1 页 说明书 3 页 附图 1 页

[54] 发明名称 用于时计的旋上柄头

[57] 摘要

本发明涉及一种用于计时的旋上柄头，该旋上柄头包括一头部，一中央部分和一侧向裙部，所述的头部包括一含有一图案设计的端面，其特征在于，该端面包括一基片，该基片的一个表面上实施了所述的图案设计，所述的基片安装成可以在所述的头部中旋转移动，该柄头还包括制动装置，该制动装置设置用于相对该头部围绕该柄头的旋转轴沿不同角度取向保持所述的基片。



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知识产权出版社出版

Masimo Ex. 1002

IPR Petition - USP 10,627,783

1. 用于时计的柄头，包括一头部，一中央部分和一侧向裙部，所述的头部包括一含有一图案设计的端面，其特征在于该端面包括一基片，在该基片上实施了所述的图案设计，所述的基片安装成可以在所述
5 所述的头部中移动，该柄头还包括制动装置，该制动装置设计用于相对头部围绕该柄头的旋转轴在不同的角度取向上保持所述的基片。

2. 根据权利要求1所述的柄头，其特征在于，所述的制动装置通过摩擦起作用。

3. 根据权利要求2所述的柄头，其特征在于，所述的制动装置包
10 括一弹性环形件。

4. 根据权利要求3所述的柄头，其特征在于，所述的环形件沿平行于该柄头的旋转轴的方向是弹性的。

5. 根据上述权利要求任一项所述的柄头，其特征在于，所述的制动装置由一环形连接件构成，该环形连接件由一可压缩材料制成。

15 6. 根据上述任一项权利要求所述的柄头，其特征在于，在该头部上加入该中央部分，所述的中央部分包括一管子，该管子在其端部中的一个端部处装有一盘片，所述的基片包括一环形边缘并且所述的基片通过其边缘轴向夹持在该盘片和头部之间。

20 7. 根据权利要求6所述的柄头，其特征在于，所述的制动装置设置在该盘片和该基片之间。

8. 根据上述任一项权利要求所述的柄头，其特征在于，该柄头是旋上类型的。

用于时计的旋上柄头

技术领域

- 5 本发明涉及用于时计的旋上或者螺纹柄头，更具体地说涉及这样的柄头，该柄头在其端面上包括一图案设计或者标志，并且其中所述的图案设计可以按需要取向。

背景技术

- 一般旋上柄头安装在表上，用于改进该表在上条柄轴或者控制轴
10 处的防水性。这种柄头的特殊性是可以占用一旋松位置和一旋紧位置，在该旋松位置中该表可以被上紧发条，可以调整为正确的时间等，在该旋紧位置中该柄头被旋紧并且锁定在一管子上，该管子被驱动进入该表的外壳的中间部分中以便压缩一密封垫，因此改进了该表的防水性能。该旋紧位置因此对应于当戴上该表时的正常位置。
- 15 公知对表外壳上的这些旋上柄头的生产和组装。然而组装这样的柄头的方法不适合于具有一标记或者一图案设计，例如标志，上标或者类似物的旋上柄头。事实上，已知的生产方法并不总是允许该柄头在被旋松后进入到一相对于该外壳的预定取向位置中，这不利于当在该柄头的端面上题字时该外壳的美学外观。当然当这样的柄头安装到
20 高质量的奢侈品上时这种情况是不能接受的。

发明内容

- 本发明的目标是克服上述的现有技术的缺陷，即提供一种结构简单经济的旋上柄头，该旋上柄头包括诸如标志或者商标的图案，其中
25 在该柄头已经旋到该管子上之后，可以容易地将实施在所述的柄头端面上的标志或者商标的位置调整到一预定的位置中或者取向位置中。

- 本发明因此涉及一种用于一时计的旋上柄头，该柄头包括一头部，一中央部分和一侧向裙部，该头部包括一含有一图案设计的端面，该柄头的特征在于，该端面包括一基片，该基片的一个表面上实施了一种图案设计，该基片安装成可以在该头部中旋转移动，并且该柄头
30 还包括制动装置，该制动装置设置成可以相对该头部围绕该柄头的旋转轴沿不同的角度取向保持该基片。

因为这些特征，一旦该柄头处于旋紧位置中，通过相对该头部克

服该制动装置的力旋转该基片，则该基片所携带的图案设计的取向就可以容易地相对于中间部分被调整到该期望的位置。由该制动装置产生的该制动力当然可以调整为在戴表时使得该基片不会无意间旋转。

根据本发明的一有利特征，该制动装置通过摩擦力作用在该基片上。使用摩擦制动装置允许了相对该表外壳对该基片及因此的图案设计的取向进行连续和细微的调整。

附图的简要说明

本发明的其它特征和优点将更清楚地出现在后面的参照附图的以非限定的示例性的方式给出的优选实施例的说明书中，附图包括：

- 10 - 图 1 示出根据本发明的旋上柄头的前视图，和
- 图 2 示出沿图 1 的线 II-II 截取的本发明的旋上柄头的截面视图。

具体实施方式

图 1 和 2 示出了用整体的附图标记 1 表示的一旋上柄头，该旋上柄头用于旋紧到一螺纹管子（未示出）上，该螺纹管子被驱动进入到一表外壳（未示出）的中央部分中。

柄头 1 包括一第一部分，该第一部分包括一头部 2，该头部 2 延伸出一侧向裙部 4，该侧向裙部 4 围绕一紧固到该头部上的中央部分 6。该头部 2 包括一端面或者前表面 8，在该前表面 8 上通过印制或者雕刻或者任何合适的方式实施有诸如标志或者商标 M 的图案设计。中央部分 6 用于以常规的方式通过一发条或者时间调整杆与该钟表装置的运动相连。在示出的实施例中，中央部分 6 被加到并紧固在头部 2 上。中央部分 6 包括一管子 10，该管子 10 在其一端安装有一盘片 12。一般通过例如焊接、粘合、压接或者任何合适的方式将该中央部分 6 25 紧固到设置在头部 2 中的第一肩部 14 中。侧向裙部 4 在其内部部分中设置有一内部螺纹 16，该螺纹 16 用于与被驱动进入该中央部分的管子的螺纹配合。在示出的实施例中，通过一紧固在裙部 4 的内壁上的螺纹环 18 加入内部螺纹。在这里还可以设计任何适合的装置来紧固，例如可以引用焊接、粘合、压接等。

30 根据本发明，端面 8 包括一支撑元件或者基片 20，该基片 20 包括一前表面 20a 和一后表面 20b，在该前表面 20a 上实施一图案设计 M。基片 20 安装成可以围绕该柄头 1 的旋转轴 A 在头部 2 中旋转移动，从

而该前表面 20a 可以从该柄头外面看见。在图 2 中可以看到头部 2 包括一开口 22, 该开口 22 具有 3 个阶梯的直径, 分别限定出第一肩部 14 和第二肩部 24, 靠着该第二肩部设有基片 20 的环形边缘 26。此外设有制动装置 28, 该制动装置 28 通过摩擦作用, 并且设置成可以相对中央部分沿不同的角度取向地固定该基片 20。因此, 当尽可能远的将柄头 1 旋在被驱动进入到中央部分中的管子上, 克服制动装置 28 产生的摩擦力可以容易地有角度地将图案设计移动到期望的位置并且保持在期望的位置中。因此将基片 20 轴向地夹持在基片 20 的后表面 20b 和盘片 12 的前表面 12a 之间。最好选择该基片的相对尺寸, 特别是其厚度及该头部的相对尺寸为使得该前表面 20a 与柄头 1 的前表面齐平以便因此形成了一连续的表面。

根据一优选实施例, 制动装置 28 包括一弹性环形件, 该环形件特别是沿平行于旋转轴 A 的方向具有弹性。一般该环形件可以由天然或者合成的压缩材料构成的连接件形成。环形件 28 在环形槽 30 中设置在盘片 12 和基片的后表面 20b 之间, 该环形槽 30 可以设置在基片(图 2) 的后表面 20b 中或者设在该盘片 12 的前表面 12a 中。

将注意到通过生产期间调整该环形件的压缩率可以控制期望的制动力。

还将注意到使用增加到该柄头上的基片允许了柄头生产者考虑头部/侧向裙部和中央部分, 并且可以通过含有不同图案设计的基片或者其它元件例如宝石或者类似物来利用这些元件。这种柄头还允许了将不同的材料组合制成由它们构成的多种元件。

将理解到在不脱离本发明的由所附的权利要求书限定的范围下对于本领域普通技术人员来说可以对本说明书中的实施例进行一些很明显的修改/或者改进。特别地, 如果沿轴 A 具有压缩的弹性, 人们可以使用波纹弹簧环代替环形连接件 28, 人们还可以设计在基片 20 的边缘和头部 2 之间设置该制动装置。在另一个变型中, 人们可以设计一些与该制动装置连接的分度刻痕, 以便设置该基片在多个预定的角度位置中。最后尽管在所示的示例中基片 20 制成板形或者盘片形, 毋庸置疑, 只要该基片可以克服该制动装置相对该柄头的部分旋转, 就可以设计其它的基片形状, 其中该柄头旋紧在该管子上, 该管子被驱动进入到中央部分中。

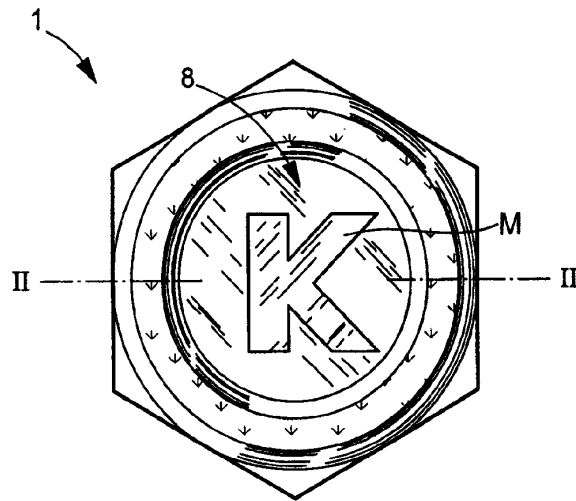


图 1

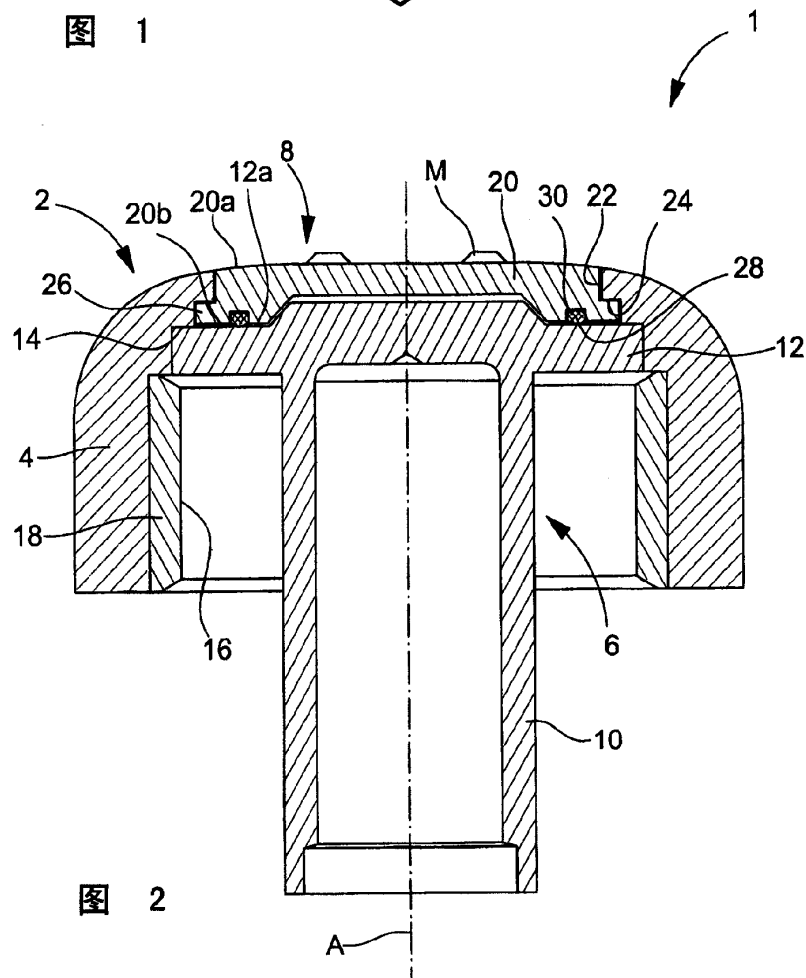


图 2



Espacenet

Bibliographic data: CN1792295 (A) — 2006-06-28

Method for mounting diamond, diocroma or the like in jadeite or jade

Inventor(s): LI JIECHENG [CN] ± (JIECHENG LI)
Applicant(s): LI JIECHENG [CN] ± (LI JIECHENG)
Classification: - **international:** **A44C17/04**
- **cooperative:**
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Abstract of CN1792295 (A)

A method for inlaying the diamond or zircon onto jadeite includes such steps as blanking, drilling one or more blind or through holes, installing inlaying nail, cutting the inlaying nail, inlaying the diamond or zircon to said inlaying nail, wrapping the edge of inlaid diamond or zircon by an expanding sleeve made of gold alloy or stainless steel, grinding and polishing.

[19] 中华人民共和国国家知识产权局

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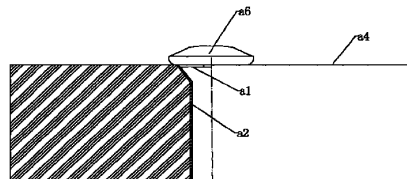
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[54] 发明名称

翡翠或玉石上镶嵌钻石和锆石等宝石的方法

[57] 摘要

一种翡翠或玉石上镶嵌钻石和锆石等宝石的方法，步骤有下料；安装镶钻钉；切割镶钻钉；镶钻；打磨抛光。其中所打孔一个或一个以上的盲孔或者通孔；膨胀套套头开设有方便套头向外扩张的裂口；孔边缘上开设有可使镶钻钉定位之卡位槽；膨胀套为贵重 K 金或者不锈钢制成；镶钻钉材质为贵重 K 金或者不锈钢。本发明提供了一种全新的在翡翠、玉石上镶嵌宝石的方法，这种方法不仅仅丰富了目前市场上首饰产品的种类，而且这种翡翠、玉石上镶嵌宝石的首饰由于镶嵌工艺独特，宝石镶嵌在镶钻钉上后还由膨胀套包紧所以镶嵌在翡翠、玉石上的宝石十分牢靠，使得饰品同时具有翡翠玉石的自然又具有宝石的特点。



1、一种翡翠或玉石上镶嵌钻石和锆石等宝石的方法，其特征在于具体步骤如下：

(1)、下料：首先将翡翠或玉石雕磨成所需要的装饰件形状，然后用罗机在需要镶钻的位置上根据需要用不同类型的罗机钻头钻T字形或锥形孔；

(2)、安装镶钻钉：将头部加工成T字形或锥形的镶钻钉置于膨胀套内后穿入步骤(1)中钻好的孔中，然后将尾部回拉拉紧镶钻钉，使膨胀套与孔壁之间呈过盈配合状态；

(3)、切割镶钻钉：将镶钻钉尾部多余的部分切割磨平与翡翠或玉石形成吻合，并对吻合面加以修饰；

(4)、镶钻：将待镶嵌的钻石、锆石等宝石镶于镶钻钉，再由膨胀套包裹住钻石、锆石等宝石的底部加以固定；

(5)、打磨抛光：把镶有宝石的镶钻钉用膨胀套包紧后对翡翠或玉石进行打磨抛光后成品。

2、根据权利要求1所述的翡翠或玉石上镶嵌钻石和锆石等宝石的方法，其特征是：所述的步骤(1)中T字形或锥形孔为盲孔或者通孔。

3、根据权利要求1或2所述的翡翠或玉石上镶嵌钻石和锆石等宝石的方法，其特征是：所述的孔为一个或一个以上。

4、根据权利要求1所述的翡翠或玉石上镶嵌钻石和锆石等宝石的方法，其特征是：所述步骤的(2)中膨胀套套头头开设有方便套头向外扩张的裂口。

5、根据权利要求2所述的翡翠或玉石上镶嵌钻石和锆石等宝石的方法，其特征是：所述孔边缘上开设有可使镶钻钉定位之卡位槽。

6、根据权利要求1或4所述的翡翠或玉石上镶嵌钻石和锆石等宝石

的方法，其特征是：所述的膨胀套为贵重 K 金或者不锈钢制成。

7、根据权利要求 1 所述的翡翠或玉石上镶嵌钻石和锆石等宝石的方法，其特征是：所述镶钻钉材质为贵重 K 金或者不锈钢。

翡翠或玉石上镶嵌钻石和锆石等宝石的方法

技术领域

本发明涉及一种镶钻、宝石的方法，尤其是一种在已成型之翡翠、玉石上镶嵌钻石、锆石等宝石的方法。

背景技术

现在的首饰装饰品、摆件、玩件，尤其是宝石、钻石等名贵首饰装饰品、摆件、玩件中，用到的最多的一般都是把钻石或者宝石镶嵌金属底座上，这些金属底座一般为 K 金或者不锈钢等材质，如申请号为 CN97116881.4 的发明专利中，就公布了一种不锈钢材的镶钻方法，它提出了一种在不锈钢材上镶嵌钻石的方法。

在贵重材质的金属底座上安装钻石锆石等宝石，还有一个共同缺陷就是：因为这些贵金属在大自然中存在的氧气氧化作用下，历久之后，难免会变色；这样一颗钻石镶嵌在变了色的底座上，总有不美之处，极大的影响了这些饰品的应有品质。由于翡翠、玉石等材质容易碎裂，现在还很少生产厂家在翡翠、玉石上镶嵌钻石或者锆石，申请号为 CN95104452.4 的发明专利中公布了一种宝玉石工艺品首饰，虽然它也是玉石底座上镶嵌钻石和锆石等宝石，但是这种首饰只是简单的在玉石上粘贴钻石、锆石等已达到两者结合的目的，而经过粘合胶粘贴的钻石或者锆石很容易从玉石底座上脱落，也会影响到钻石、锆石等宝石应有的产品品质。

发明内容

本发明所要解决的技术问题旨在克服现有技术中所述的上述钻石、锆石等宝石粘接于翡翠或玉石上容易脱落的缺陷，提供一种可以牢固地将钻

石、锆石等固定在翡翠、玉石上的镶嵌方法。

为实现上述发明目的，本发明所提出的技术方案是：

一种翡翠、玉石上镶嵌钻石和锆石等宝石的方法，其特征是具体步骤如下：

(1)、下料：首先将翡翠或玉石雕磨成所需要的装饰件形状，然后用罗机在需要镶钻的位置上根据需要用不同类型的罗机钻头钻T字形或锥形孔；

(2)、安装镶钻钉：将头部加工成T字形或锥形的镶钻钉置于膨胀套内后穿入步骤(1)中钻好的孔中，然后将尾部回拉拉紧镶钻钉，使膨胀套与孔壁之间呈过盈配合状态；

(3)、切割镶钻钉：将镶钻钉尾部多余的部分切割磨平与翡翠或玉石形成吻合，并对吻合面加以修饰；

(4)、镶钻：将待镶嵌的钻石、锆石等宝石镶于镶钻钉，再由膨胀套包裹住钻石、锆石等宝石的底部加以固定；

(5)、打磨抛光：把镶有宝石的镶钻钉用膨胀套包紧后对翡翠或玉石进行打磨抛光后成品。

所述的步骤(1)中T字形或锥形孔为盲孔或者通孔。

所述的孔为一个或一个以上。

所述步骤的(2)中膨胀套套头头开设有方便套头向外扩张的裂口。

所述孔边缘上开设有可使镶钻钉定位之卡位槽。

所述的膨胀套为贵重K金或者不锈钢制成。

所述镶钻钉材质为贵重K金或者不锈钢。

本发明的翡翠、玉石上镶嵌钻石和锆石等宝石的方法，提供了一种全新的在翡翠、玉石上镶嵌钻石或者锆石等宝石的方法，这种方法不仅仅丰富了目前市场上首饰产品的种类，而且这种翡翠、玉石上镶嵌钻石和锆石等宝石的首饰由于镶嵌工艺独特，钻石、锆石等宝石镶嵌在镶钻钉上后还

由膨胀套包紧所以镶嵌在翡翠、玉石上的钻石或者锆石等宝石十分牢靠，根据需要还可以在所打的孔边缘不开或者开固定镶钻钉的卡位槽，这样没有卡位槽的镶钻钉带动宝石在孔内可轻微旋转，使得钻石的光辉可以不停闪烁，而开有卡位槽的镶钻钉则更加牢固地固定在翡翠、玉石之上，满足了市场上客户不同的需求。本发明所得的饰品，让钻石、锆石等宝石应有的品质可以永久保持。

说明书附图

图 1 是本发明实施例一镶钻钉图

图 2 是本发明实施例一膨胀套图

图 3 是本发明实施例一翡翠开孔后剖视图

图 4 是本发明实施例一安装结构剖视图

图 5 是本发明实施例一安装钻石后结构图

图 6 是本发明实施例二翡翠开孔后剖视图

图 7 是本发明实施例二镶钻钉图

图 8 是本发明实施例二膨胀套图

图 9 是本发明实施例二安装结构剖视图

图 10 是本发明实施例二安装钻石后结构图

具体实施方式

本发明提供一种全新的可以牢固把钻石、锆石等固定在翡翠、玉石上的镶嵌方法。

以下通过本发明方法的具体实施例来解读本发明：

实施例一：

图 1、2、3、4、5 均为本发明实施例一结构剖视图。本实施例中以及下文提到的实施例二中材料的材质均相同，即镶钻钉取不锈钢，膨胀套取不锈钢，饰品取翡翠。

由图 1、2、3、4 分析本发明方法的具体步骤如下：

(1)、下料：首先将翡翠 a4 雕磨成所需要的装饰形状，然后用罗机在需要镶钻的位置上用罗机钻头打出孔头为 T 字形或锥形孔的孔 a5；在本实施例中，孔 a5 为通孔；

(2)、安装镶钻钉：将一个头略呈 T 字的镶钻钉 a1 用一个头部也呈 T 字的膨胀套 a2 包裹后将 T 字镶钻钉 a1 穿入步骤 (1) 中打好的孔 a5 中，然后由尾部拉紧镶钻钉 a1；其中膨胀套 a2 上端开有方便套头向外扩张的裂口 a3，这样当由镶钻钉 a1 尾部拉紧镶钻钉 a1 时，镶钻钉 a1 的头部 T 字形给膨胀套 a2 施加向下的压力，膨胀套 a2 的裂口 a3 在压力作用下向外扩张后卡在孔 a5 内卡紧成过盈配合状态；

(3)、切割镶钻钉：将镶钻钉 a1 尾部多余的部分切割磨平与翡翠 a4 面形成吻合，并对吻合面加以修饰使镶钻钉 a1 和翡翠 a4 能够自然统一；

(4)、镶钻：在镶钻钉 a1 T 字头上镶嵌钻石或者锆石等宝石，镶嵌好的钻石、锆石等宝石再经由膨胀套 a2 包裹住钻石或锆石等宝石的底部加以固定，这样包裹住的钻石或者锆石非常牢固地固定在镶钻钉 a1 的 T 头上；

(5)、打磨抛光：把镶钻的一头用 T 字膨胀套包紧后对翡翠进行打磨抛光后即可成品出厂。

图 5 是本发明实施例一安装钻石后结构剖视图，这样钻石 a6 就牢固地安装在了翡翠 a4 之上，并且兼有玉石与钻石的自然特点。

在本实施例中，没有用到卡位槽这个装置，当然也可以开有卡位槽，这是根据市场需要而设定，没有卡位槽的镶钻钉带动宝石在孔内可轻微旋转，使得钻石的光辉可以不停闪烁，而开有卡位槽的镶钻钉则更加牢固地

固定在翡翠、玉石之上，满足了市场上客户不同的需求。

实施例二：

图 6、7、8、9、10 均为本发明实施例二结构剖视图。。

由图 6、7、8、9 分析本发明方法的具体步骤如下：

(1)、下料：首先将翡翠 b4 雕磨成所需要的装饰形状，然后用罗机在需要镶钻的位置上用罗机钻头打出孔头为 T 字形或锥形的孔 b5；在本实施例中，孔 b5 为盲孔；

(2)、安装镶钻钉：将一个头略呈 T 字的镶钻钉 b1 用一个头部也呈 T 字的膨胀套 b2 包裹后将 T 字镶钻钉 b1 穿入 (1) 中打好的孔 b5 中，然后由尾部拉紧镶钻钉 b1；其中膨胀套 b2 上端开有方便套头向外扩张的裂口 b3，这样当由镶钻钉 b1 尾部拉紧镶钻钉 b1 时，镶钻钉 b1 的头部 T 字形给膨胀套 b2 施加向下的压力，膨胀套 b2 的裂口 b3 在压力作用下向外扩张后卡在孔 b5 内卡紧成过盈配合状态；

(3)、切割镶钻钉：将镶钻钉 b1 尾部多余的部分切割磨平与翡翠 b4 面形成吻合，并对吻合面加以修饰使镶钻钉 b1 和翡翠 b4 能够自然统一；

(4)、镶钻：在镶钻钉 b1 切割后的切割面上镶嵌钻石或者锆石等宝石，镶嵌好的钻石、锆石等宝石再经由膨胀套 b2 包裹住钻石或锆石等宝石的底部加以固定，这样包裹住的钻石或者锆石非常牢固地固定在镶钻钉 b1 上；

(5)、打磨抛光：把镶钻的一头用 T 字膨胀套包紧后对翡翠进行打磨抛光后即可成品出厂。

图 10 是本发明实施例二安装钻石后结构图，钻石 b6 镶嵌在镶钻钉 b1 尾部切割部位由膨胀套 b2 包裹住。由图中可以看出本发明的两个特点，当孔为通孔时，钻石镶嵌在镶钻钉的 T 字形头部，而当孔为盲孔时，则把钻石镶嵌在镶钻钉的切割部位，因为此时镶钻钉 T 字形头部在翡翠或玉石的内部。

在本实施例中，也没有用到卡位槽这个装置，当然也可以开有卡位槽，这是根据市场需要而设定，没有卡位槽的镶钻钉带动宝石在孔内可轻微旋转，使得钻石的光辉可以不停闪烁，而开有卡位槽的镶钻钉则更加牢固地固定在翡翠、玉石之上，满足了市场上客户不同的需求。

本发明的翡翠、玉石上镶嵌钻石和锆石等宝石的方法，提供了一种全新的在翡翠、玉石上镶嵌钻石或者锆石等宝石的方法，这种方法不仅仅丰富了目前市场上首饰产品的种类，而且这种翡翠、玉石上镶嵌钻石和锆石等宝石的首饰由于镶嵌工艺独特所以镶嵌在翡翠、玉石上的钻石或者锆石等宝石十分牢靠，根据需要还可以在所打的孔边缘不开或者开固定镶钻钉的卡位槽，这样没有卡位槽的镶钻钉带动宝石在孔内可轻微旋转，使得钻石的光辉可以不停闪烁，而开有卡位槽的镶钻钉则更加牢固地固定在翡翠、玉石之上，满足了市场上客户不同的需求。本发明所得的饰品，让钻石、锆石等宝石应有的品质可以永久保持。

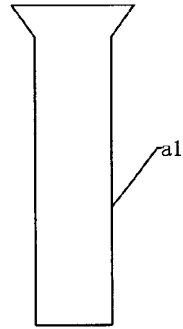


图 1

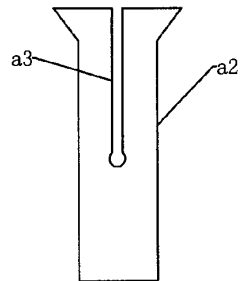


图 2

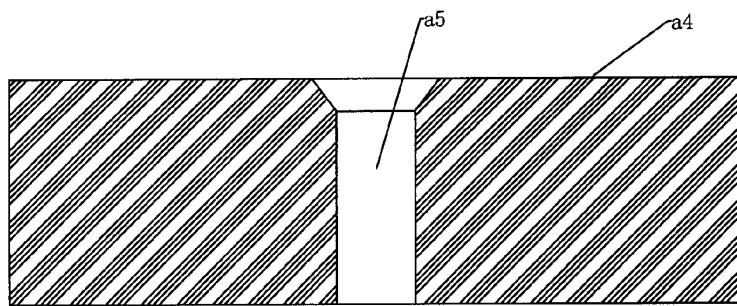


图 3

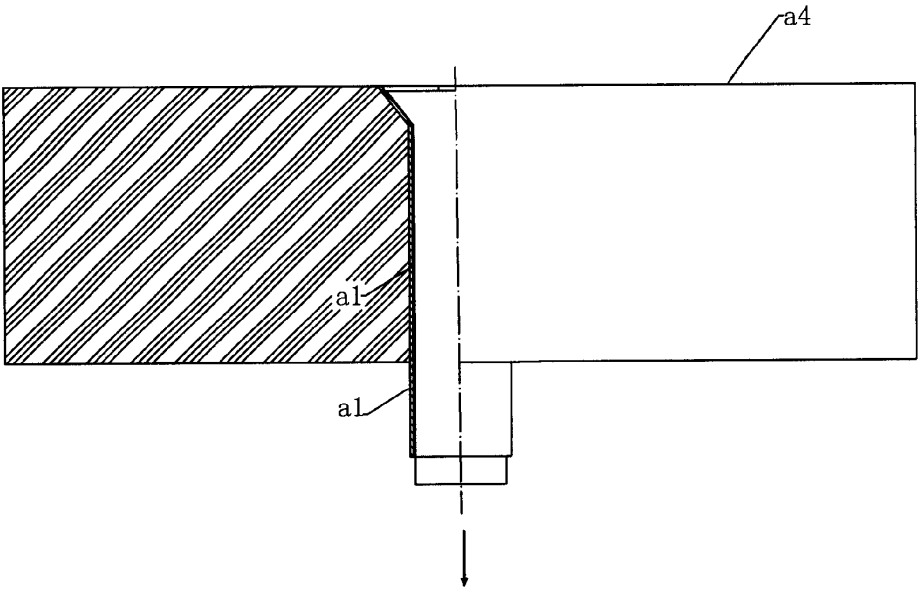


图 4

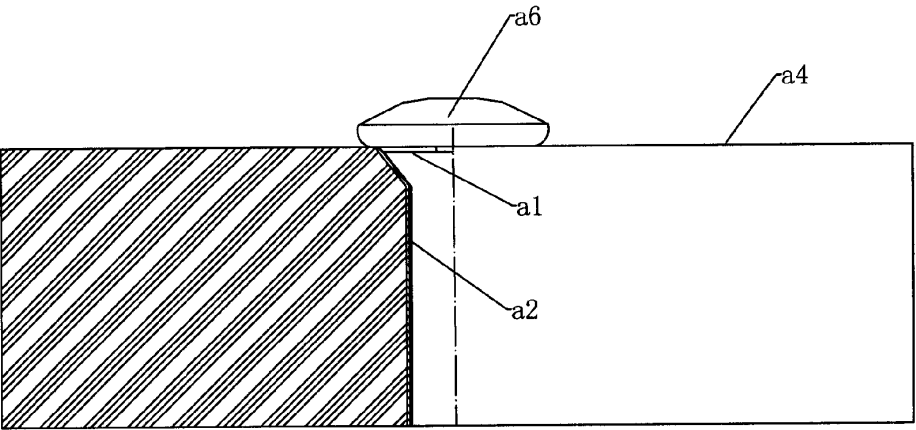


图 5

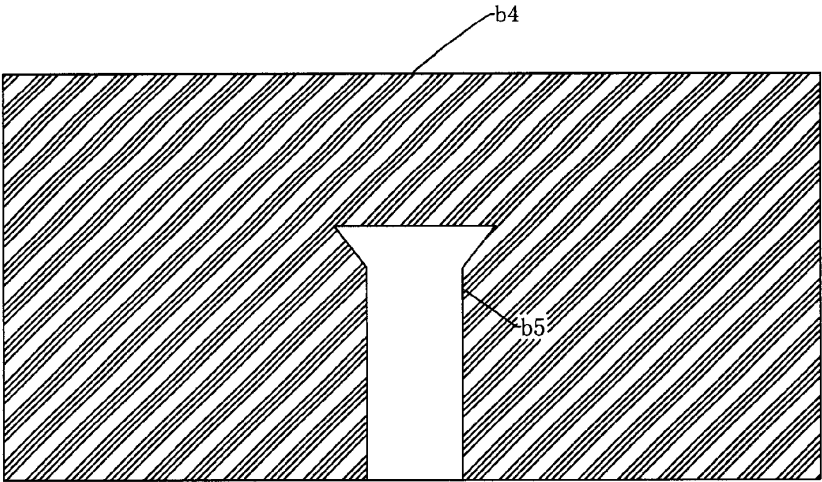


图 6

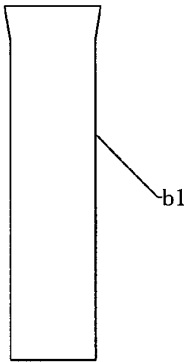


图 7

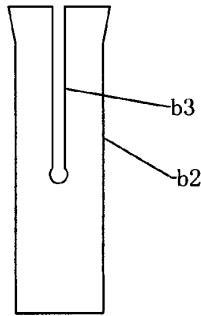


图 8

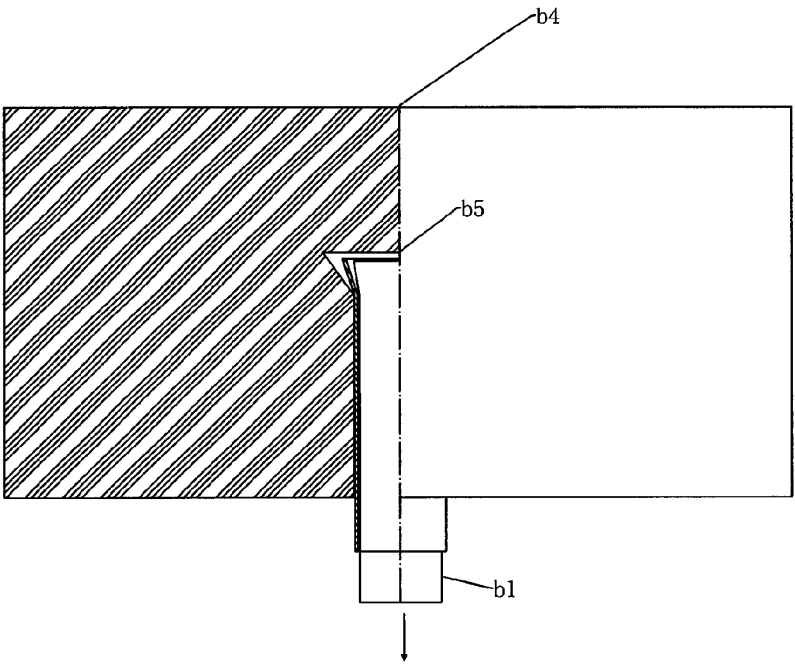


图 9

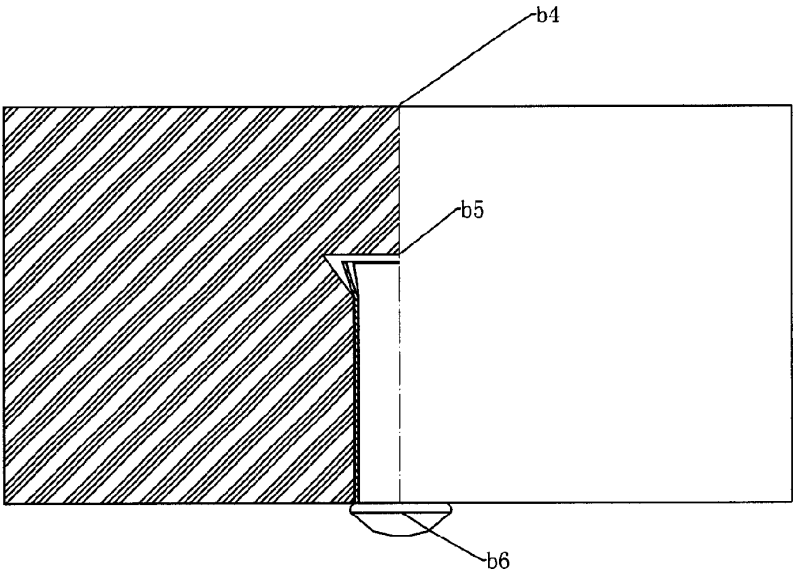


图 10



Espacenet

Bibliographic data: CN103253067 (A) — 2013-08-21

Device for anchoring metal incrustation

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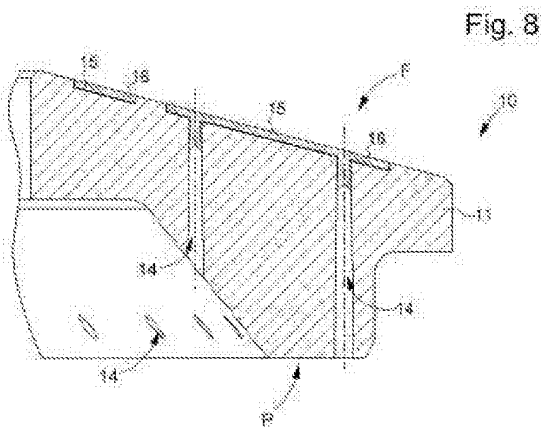
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Abstract of CN103253067 (A)

The invention relates to an element (10) including a body (11, 18, 18') comprising at least one recess (12) forming the pattern cavity for a decoration (13), said at least one recess being entirely filled by a galvanic deposition (16) in order to form an element (10) inlaid with at least one metallic decoration (13) with improved visual quality. According to the invention, the element (10) includes a device for fixedly securing said at least one metallic decoration communicating with said at least one recess in order to improve the securing of said at least one decoration against said element. The invention concerns the field of timepieces or pieces of jewellery.





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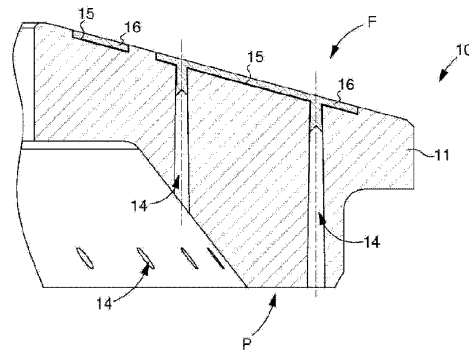
权利要求书2页 说明书6页 附图6页

(54) 发明名称

用于固定地紧固金属镶嵌物的装置

(57) 摘要

本发明涉及一种元件(10),该元件(10)包括体部(11,18,18'),该体部(11,18,18')包括至少一个形成装饰物(13)的图案空腔的凹槽(12),所述至少一个凹槽由电沉积物(16)完全填充,以便形成镶嵌有至少一个具有改善的视觉质量的金属装饰物(13)的元件(10)。根据本发明,所述元件(10)包括用于固定地紧固所述至少一个金属装饰物的紧固装置,该紧固装置与所述至少一个凹槽连通,以便改善所述至少一个装饰物相对于所述元件的紧固。本发明涉及钟表或珠宝首饰领域。



1. 一种元件(10),该元件(10)包括体部(11,18,18'),该体部(11,18,18')包括至少一个形成装饰物(13)的图案空腔的凹槽(12),所述至少一个凹槽由电沉积物(16)完全填充,以便形成镶嵌有至少一个具有改善的视觉质量的金属装饰物(13)的元件(10),其特征在于,所述元件包括用于固定地紧固所述至少一个金属装饰物的紧固装置,该紧固装置包括至少一个贯穿所述元件(10)的孔(14),该孔(14)与所述至少一个凹槽(12)连通并由所述电沉积物(16)至少部分填充,以便改善所述至少一个装饰物相对于所述元件的紧固。

2. 根据权利要求1所述的元件(10),其特征在于,所述至少一个孔(14)的直径随着其远离所述至少一个凹槽(12)逐渐向外扩展,以便相对于所述元件保持所述电沉积物(16)。

3. 根据权利要求1所述的元件(10),其特征在于,所述电沉积物(16)完全填充所述至少一个孔(14)。

4. 根据权利要求3所述的元件(10),其特征在于,所述电沉积物(16)覆盖所述至少一个孔(14)的与所述至少一个凹槽(12)连通的端部相对的端部的肩部(19),以便阻止所述至少一个装饰物(13)相对于所述体部(18,18')的任何运动。

5. 根据权利要求1所述的元件(10),其特征在于,所述电沉积物(16)包括金和/或铜和/或银和/或钨和/或铂和/或钯和/或镍。

6. 根据权利要求1所述的元件(10),其特征在于,所述至少一个凹槽(12)中的每一个都具有在80 μ m和200 μ m之间的深度,以便提高粘附力。

7. 根据权利要求1所述的元件(10),其特征在于,所述体部(11,18,18')由导电的陶瓷材料制成。

8. 根据权利要求7所述的元件(10),其特征在于,所述体部(11,18,18')完全或部分由金属陶瓷形成。

9. 根据权利要求1所述的元件(10),其特征在于,所述体部(11,18,18')是不导电的,所述装饰物(13)还包括至少一层在所述体部(11,18,18')和所述电沉积物(16)之间的基本上50nm的导电层(15)。

10. 根据权利要求9所述的元件(10),其特征在于,所述体部(11,18,18')由氧化锆基材形成。

11. 一种钟表(1),其特征在于,它包括至少一个根据前述权利要求中的任一项所述的元件(10)。

12. 根据权利要求11所述的钟表(1),其特征在于,所述至少一个元件的体部(11,18,18')形成表壳(2)和/或表链(3)和/或表圈(4)和/或表盘(5)和/或表镜(6)和/或按钮(7)和/或表冠(8)的全部或部分。

13. 一种珠宝首饰,其特征在于,它包括至少一个根据权利要求1至10中的任一项所述的元件(10)。

14. 一种用于制造元件(10)的方法(21),该方法(21)包括以下步骤:

a) 形成体部(11,18,18');

b) 在所述体部(11,18,18')的一个表面(F)上蚀刻至少一个凹槽(12),所述至少一个凹槽中的每一个都形成用于装饰物(13)的图案空腔;

c) 蚀刻至少一个贯穿所述体部(11,18,18')并与所述至少一个凹槽(12)连通的孔(14),以便形成紧固装置;

d) 电沉积金属材料(16), 以便完全填充所述至少一个凹槽和至少部分填充所述至少一个孔;

e) 从所述体部(11, 18, 18') 的表面去除所有沉积物(16), 使得所述沉积物仅留在所述至少一个凹槽和所述至少一个孔的中空部内。

15. 根据权利要求 14 所述的方法(21), 其特征在于, 所述至少一个孔(14) 的直径随着其远离所述至少一个凹槽(12) 逐渐向外扩展, 以便相对于所述元件保持所述电沉积物(16)。

16. 根据权利要求 14 所述的方法(21), 其特征在于, 在步骤 d) 期间, 所述金属沉积物(16) 完全填充所述至少一个孔(14)。

17. 根据权利要求 16 所述的方法(21), 其特征在于, 在步骤 d) 中, 所述金属沉积物(16) 覆盖所述至少一个孔(14) 的与所述至少一个凹槽(12) 连通的端部相对的端部的肩部(19), 以便阻止所述至少一个装饰物(13) 相对于所述体部(18) 的任何运动。

18. 根据权利要求 14 所述的方法(21), 其特征在于, 所述体部(11) 由导电的陶瓷材料制成。

19. 根据权利要求 14 所述的方法(21), 其特征在于, 所述体部(11, 18, 18') 由不导电的陶瓷材料制成, 并且在步骤 c) 和步骤 d) 之间所述方法(21) 还包括以下步骤:

f) 在包括所述至少一个凹槽和所述至少一个孔的整个表面(F) 上沉积至少一层大约 50nm 的导电层(15)。

20. 根据权利要求 19 所述的方法(21), 其特征在于, 步骤 f) 通过化学镀或物理气相沉积实现。

21. 根据权利要求 18 至 20 中的任一项所述的方法(21), 其特征在于, 步骤 a) 通过烧结实现。

22. 根据权利要求 14 所述的方法(21), 其特征在于, 步骤 b) 通过使用激光在 80 μm 和 200 μm 之间的深度处实现, 以便提高粘附力。

23. 根据权利要求 14 所述的方法(21), 其特征在于, 步骤 c) 通过从与将接纳所述至少一个凹槽(12) 的表面(F) 相对的表面(P) 定向激光束利用激光来实现。

24. 根据权利要求 14 所述的方法(21), 其特征在于, 调换步骤 b) 和 c) 的顺序。

25. 根据权利要求 14 所述的方法(21), 其特征在于, 至少一个凹槽(12) 中的每一个都包括连续的或至少部分平坦的表面(R), 以便有利于步骤 d) 的实施。

用于固定地紧固金属镶嵌物的装置

技术领域

[0001] 本发明涉及一种镶嵌有至少一个金属装饰物的元件，且更具体地，本发明涉及一种包括用于固定地紧固至少一个金属装饰物的装置的元件。

背景技术

[0002] 已知的是，形成至少部分由人造蓝宝石制成的表圈，以便通过透明显示出覆盖在位于表圈下面的凹槽中的沉积物，所述沉积物例如形成刻度或商标名称。这种结构具有这样的优点：通过用蓝宝石部分完全覆盖沉积物，防止了沉积物机械降解。然而，这种结构会使得难以读取装饰物，这是因为沉积物的色彩由于传递而改变并且在蓝宝石和沉积物之间不存在色调差异。

发明内容

[0003] 本发明的目的是，克服上述缺点的全部或部分，同时保持机械抵抗力的优点并增加改善的视觉质量的优点。

[0004] 因此，本发明涉及一种元件，该元件包括体部，该体部包括至少一个形成装饰物的图案空腔的凹槽，所述至少一个凹槽由电沉积物完全填充，以便形成镶嵌有至少一个具有改善的视觉质量的金属装饰物的元件，其特征是，所述元件包括用于固定地紧固所述至少一个金属装饰物的紧固装置，该紧固装置包括贯穿所述元件的至少一个孔，该孔与所述至少一个凹槽连通并由所述电沉积物至少部分填充，以便改善所述至少一个装饰物相对于所述元件的紧固。

[0005] 有利地，根据本发明，在不改变美学外观的情况下，装饰物因此更难以取下。

[0006] 根据本发明的其它有利特征：

[0007] - 所述至少一个孔的直径随着其远离所述至少一个凹槽逐渐向外扩展，以便相对于所述元件保持所述电沉积物。

[0008] - 电沉积物完全填充所述至少一个孔；

[0009] - 电沉积物覆盖位于所述至少一个孔的与所述至少一个凹槽连通的端部相对的端部处的肩部，以便阻止所述至少一个装饰物相对于所述体部的任何运动；

[0010] - 电镀金属沉积物包括金和 / 或铜和 / 或银和 / 或钨和 / 或铂和 / 或钯和 / 或镍；

[0011] - 所述至少一个凹槽中的每一个都具有在 $80\text{ }\mu\text{m}$ 和 $200\text{ }\mu\text{m}$ 之间的深度，以便提高粘附力；

[0012] - 所述体部由导电陶瓷材料——例如金属陶瓷——制成；

[0013] - 所述体部是不导电的，例如氧化铅基的，所述装饰物还包括至少一层在所述体部和所述电沉积物之间的基本上 50nm 的导电层。

[0014] 此外，本发明涉及钟表的外部部件的一部分，或更一般地涉及钟表或珠宝首饰，其特征在于，它包括至少一个根据前述变型中的任一个所述的元件。

[0015] 最后，本发明涉及一种制造元件的方法，其包括以下步骤：

- [0016] a) 形成体部；
- [0017] b) 在体部的一个表面上蚀刻至少一个凹槽，所述至少一个凹槽中的每一个都形成用于装饰物的图案空腔；
- [0018] c) 在所述体部中蚀刻至少一个与所述至少一个凹槽连通的通孔，以便形成紧固装置；
- [0019] d) 电沉积金属材料，以便完全填充所述至少一个凹槽和至少部分填充所述至少一个孔；
- [0020] e) 从所述体部的表面去除所有沉积物，以便沉积物仅留在所述至少一个凹槽和所述至少一个孔中的中空部内。
- [0021] 有利地，根据本发明，将装饰物制造在元件内部深处，因此在不改变所述装饰物的美学外观的情况下使它们更加难以去除。
- [0022] 根据本发明的其它有利特征：
- [0023] - 所述至少一个孔的直径随着其远离所述至少一个凹槽逐渐向外扩展，以便相对于所述元件保持所述电沉积物；
- [0024] - 在步骤 d) 中，金属沉积物完全填充所述至少一个孔；
- [0025] - 在步骤 d) 中，金属沉积物覆盖所述至少一个孔的与所述至少一个凹槽连通的端部相对的端部的肩部，以便阻止至少一个装饰物相对于体部的任何运动；
- [0026] - 体部由导电的陶瓷材料制成；
- [0027] - 体部由不导电的陶瓷材料制成，并且在步骤 c) 和步骤 d) 之间，该方法包括步骤 f)：在包括所述至少一个凹槽和所述孔的整个表面上沉积至少一层基本上 50nm 的导电层；
- [0028] - 步骤 f) 通过化学镀或物理气相沉积实现；
- [0029] - 步骤 a) 通过烧结实现；
- [0030] - 步骤 b) 通过使用激光在 80 μm 和 200 μm 之间的深度处实现，以便提高粘附力；
- [0031] - 步骤 c) 通过从与将接纳所述至少一个凹槽的表面相对的表面定向激光束利用激光来实现；
- [0032] - 调换步骤 b) 和 c) 的顺序；
- [0033] - 至少一个凹槽中的每一个都包括连续的至少部分倒圆的表面，以便有利于步骤 d) 的实施。

附图说明

- [0034] 从下面结合附图通过非限制实施例给出的描述中，其它特征和优点将变得更加清楚，其中：
- [0035] - 图 1 是根据本发明的钟表的简图；
- [0036] - 图 2 是根据本发明被镶嵌之前的陶瓷元件的俯视图；
- [0037] - 图 3 至图 8 是根据本发明的制造方法的连续步骤；
- [0038] - 图 9 是根据本发明的方法的流程图；
- [0039] - 图 10 和图 11 是根据本发明的紧固装置的可选实施例。

具体实施方式

[0040] 图 1 中示出的示例示出钟表,该钟表总体上由附图标记 1 指示,该钟表包括至少一个镶嵌元件 10。每个镶嵌元件 10 将形成非常抗磨损的部分,该镶嵌元件 10 包括至少一个金属装饰物 13,该金属装饰物 13 的视觉质量尤其在对比度方面得到改善。

[0041] 根据本发明的镶嵌元件 10 可形成钟表 1 的外部部件的全部或部分。因此,它可以形成表壳 2、表链 3、表圈 4、表盘 5、表镜 6、按钮 7 和 / 或表冠 8 的全部或部分。在下面示出的示例中,参考包括镶嵌装饰物 13 的环 10 对本发明进行说明,所述镶嵌装饰物 13 形成表圈 4 的刻度标记。还可以形成用于钟表机芯——例如桥夹板和 / 或机板和 / 或振荡摆锤——的镶嵌元件 10。

[0042] 如图 1、图 2 和图 8 所示,镶嵌的陶瓷元件 10 包括体部 11,该体部 11 包括至少一个凹槽 12,该凹槽 12 形成用于装饰物 13 的图案空腔。图 1 示出,有利地,根据本发明,每个装饰物 13 可采用任何形式,例如几何图形或字母数字字符。根据本发明,每个凹槽 12 都完全由金属材料形成的电沉积物 16 填充。这种结构保护在体部 11 内的每个装饰物 13。

[0043] 根据优选实施例,体部 11 由导电材料——例如金属陶瓷——制成。金属陶瓷是由陶瓷和金属的混合物制成的。例如它可以包括 TiC、SiN 或 ZrC,以形成体部 11 的全部或部分。

[0044] 然而,根据第二变型,体部 11 也可以由不导电的材料制成。在这种情况下,装饰物 13 还包括至少一层在体部 11 和电沉积物 16 之间的基本上 50nm 的导电层 15。此时,体部 11 例如可由氧化锆基陶瓷形成,氧化锆基陶瓷的使用是由于其机械性能、抛光能力以及在较小程度上它提供广泛的颜色调色板的能力。

[0045] 因此,显然,根据本发明,体部 11 可以由导电或不导电的材料形成。因此,体部 11 可由多种材料获得。

[0046] 为了改进装饰物 13 在体部 11 中的粘附性,凹槽 12 优选具有在 80 μ m 和 200 μ m 之间的深度。

[0047] 此外,为了电沉积物的粘附性,优选地,每个凹槽 12 都具有连续的、至少部分倒圆的表面,即,其内表面不包括任何边缘。

[0048] 最后,镶嵌元件 10 还包括用于固定地紧固所述至少一个金属装饰物 13 的紧固装置,该紧固装置与所述至少一个凹槽 12 连通,以便改进所述至少一个装饰物 13 相对于所述元件 10 的紧固。优选地,紧固装置包括至少一个贯穿所述元件 10 的孔 14,该孔 14 至少部分由所述电沉积物 16 以及在合适的情况下所述至少一层导电层 15 填充,以便增加与所述元件接触的表面。

[0049] 在图 8 示出的示例中,还可以看到,孔 14 的直径随着其逐渐远离所述至少一个凹槽 12 逐渐向外扩展,以便相对于所述元件 10 紧固所述电沉积物 16 以及在合适的情况下所述至少一层导电层 15。实际上,在孔 14 是基本上圆锥形的情况下,由于孔 14 的向凹槽 12 内开口的部分的直径比孔 14 的其它部分的小,所以装饰物 13 不能再移除。

[0050] 根据图 10 和图 11 示出的紧固装置的可选实施例,电沉积物 16 也可完全填充所述至少一个孔 14,以便使与元件的体部 18、18' 接触的表面最大化。当体部 18、18' 的厚度基本上等于或小于凹槽 12 的深度的四倍时,例如钟表表盘 5,这两个可选实施例是可行的。

[0051] 根据图 10 示出的第一可选实施例,体部 18 包括至少一个凹槽 12,该凹槽 12 与在与表面 F 相对的表面 P 上开口的至少一个孔 14 连通,该表面 F 将接纳所述至少一个凹槽

12。因此,显然,体部 18 在两个侧面上都是中空的。此外,优选地,电沉积物 16 覆盖位于所述至少一个孔 14 的与所述至少一个凹槽 12 连通的端部相对的端部处的肩部 19,以便阻止所述至少一个装饰物 13 相对于体部 18 的任何运动。因此,显然,电沉积物 16 相对于所述相对表面 P 突出出来。

[0052] 根据图 11 示出的第二可选实施例,体部 18' 包括至少一个凹槽 12,该凹槽 12 与在与表面 F 相对的表面 P 中的凹槽 20 上开口的至少一个孔 14 连通,该表面 F 将接纳所述至少一个凹槽 12。因此,显然,体部 18' 在两个侧面上都是中空的。此外,优选地,电沉积物 16 覆盖位于所述至少一个孔 14 的与所述至少一个凹槽 12 连通的端部相对的端部处的肩部 19,以便阻止所述至少一个装饰物 13 相对于体部 18' 的任何运动。因此,显然,电沉积物 16 将仅保留在凹槽 20 中,即,相对于所述相对表面 P 不突出出来。

[0053] 可选地,可以使用用于提高将来的装饰物 13 粘附在体部 11 上的粘附性的层。实际上,虽然凹槽 12 的底部的微粗糙度和紧固装置有助于粘附,但是可在电沉积物 16 以及在合适的情况下导电层 15 与体部 11、18、18' 之间沉积例如基本上 50nm 的层。根据用于该中间层的沉积方法,可以设想若干类型的材料,例如 Cr、Cr₂N、TiN、TiW、Ni、NiP、Cu、Ti 或 Zr。

[0054] 电沉积物 16 以及在合适的情况下所述至少一层导电层 15 也可由多种材料形成。优选地,对于第二变型,选取具有粘附性能和电铸所必须的高导电能力的导电层 15。

[0055] 此外,根据本发明,每个装饰物 13 的视觉效果主要通过电沉积物 16 的色彩获得。因此,用于电沉积物 16 的材料优选根据色彩或更一般地根据其外形美观来选择。因此,金属电沉积物 16 和附带地层 15 包括金和 / 或铜和 / 或银和 / 或铟和 / 或铂和 / 或钯和 / 或镍。

[0056] 通过示例,因此可以通过给予体部 11 光亮的外观以及给予装饰物 13 缎纹的外观获得复杂的视觉效果。而且,装饰物 13 还可由相同的金属形成,以提供一致的外观,或者由若干不同的金属形成,以便例如在两个装饰物之间提供不同色彩,例如,在图 1 的情况下,一种用于刻度的色彩,另一种用于字母数字字符的色彩。

[0057] 为了使颜色均匀,还可以设想用与周围体部 11、18、18' 相同的材料形成装饰物 13。因此,在图 1 的实施例中,可以使表圈 4 的装饰物 13 具有与表壳 2、表链 3、表圈 4 的其余部分、表盘 5、表镜 6、按钮 7 和 / 或表冠 8 相同材料。

[0058] 可选地,根据本发明,镶嵌元件 10 还可以提供可选择的、基本上透明的层,以便防止装饰物 13 老化。上述层可以例如包括氮化硅,以防止电沉积物 16 以及在合适的情况下所述至少一层导电层 15 失去光泽,尤其是当它们主要是银基的时。

[0059] 现在结合附图 2 至图 9 通过不导电的陶瓷体部的示例对制造镶嵌元件 10 的方法 21 进行描述。当然,体部 11 可以由除了不导电陶瓷以外的其它材料制成,如上所述。

[0060] 在图 9 示出的第一步骤 22 中,方法 21 在于:形成例如氧化锆的体部 11。如由图 3 至图 4 的变化部分地示出的,步骤 22 的最终体部 11 优选通过烧结获得,即,由经由注射工艺形成的未焙烧的体部 17 获得最终的体部 11。在步骤 22 结束时,在图 4 示出的体部 11 具有其最终的尺寸。

[0061] 如图 9 所示,方法 21 包括第二步骤 23,用于在陶瓷体部 11 的一个表面 F 上蚀刻至少一个盲凹槽 12,其中,凹槽 12 形成用于将来的装饰物 13 的图案空腔,如图 2 和图 5 所示。优选地,每个凹槽 12 具有在 80 μm 和 200 μm 之间的深度 P。此外,优选地,每个凹槽 12 具

有连续的、至少部分倒圆的表面,以便有利于如下所述的电铸步骤 26 的实施。步骤 23 优选通过使用激光进行破坏性辐射获得,以便获得高精度的蚀刻。

[0062] 如图 9 所示,方法 21 继续用于蚀刻至少一个孔 14 的第三步骤 24,所述孔 14 与每个凹槽 12 连通,以便形成紧固装置。如图 2 和图 6 所示,根据每个凹槽 12 的形状和跨度,制造一个或多个用于每个凹槽 12 的孔 14。步骤 24 优选通过使用激光进行破坏性辐射获得,以便获得高精度的蚀刻。

[0063] 根据本发明,每个孔 14 穿过元件 10 的体部 11,使得它可以在步骤 26 期间至少部分由金属材料 16 以及在合适的情况下在步骤 25 和 25' 中由所述至少一层导电层 15 填充,以便增加与所述元件接触的表面。实际上,显然,电解质因此可以在电铸步骤 26 中在凹槽 12 “前面”和“后面”流动,即,它可以在任何时候沉积在每个凹槽 12 和每个孔 14 中。

[0064] 最后,如图 6 所示,每个孔 14 的直径随着其逐渐远离所述至少一个凹槽 12 逐渐向外扩展,以便相对于元件 10 阻挡将来的金属材料 16 以及在合适的情况下所述至少一层导电层 15。实际上,如上所述,在每个孔 14 是基本上圆锥形的情况下,由于孔 14 的向凹槽 12 内开口的部分的直径比孔 14 的其它部分的小,所以装饰物 13 不能再移除。优选地,因此每个孔 14 在凹槽 12 的底部处具有基本上等于 100 μm 的直径,并在与体部 11 相对的表面 P 上以基本上等于 120 μm 或更大的直径结束。

[0065] 优选地,有利地,根据本发明,步骤 24 通过从相对表面 P 定向激光束来实现,以便立即形成以锥形的方式的所述至少一个孔 14,即,最大的直径处于与相对表面 P 的接合处。

[0066] 在第一实施例中,如图 9 中的三线所示,步骤 24 接着是方法 21 的步骤 25',该步骤 25' 在于:在包括所述至少一个凹槽 12 和所述至少一个孔 14 的整个表面 F 上沉积至少一层基本上 50nm 的导电层 15。步骤 25' 可通过湿法——例如化学镀——实现,或通过干法——例如物理气相沉积——实现。在第一实施例中,在步骤 25' 之后,方法 21 继续步骤 26。

[0067] 因此,上述层 15 可以例如由金和 / 或铜和 / 或银和 / 或钨和 / 或铂和 / 或钨和 / 或镍制成。

[0068] 在第二实施例中,如图 9 中的双线所示,步骤 24 接着是方法 21 的步骤 25,该步骤 25 在于沉积如上所述的中间层。此时,中间层优选使用干法——例如物理气相沉积——制成。在第二实施例中,在上述步骤 25 之后,方法 21 在进入步骤 26 之前继续第一实施例的步骤 25',或者直接继续步骤 26。

[0069] 最后,在第三实施例中,如图 9 中的单线所示,步骤 24 直接接着步骤 26。该实施例涉及第一变型,该第一变型优选使用导电陶瓷作为用于体部的材料 11。

[0070] 步骤 26 在于:从体部 11 的表面 F 以及在合适的情况下从导电层 15 电沉积金属材料 16,以便完全填充每个凹槽 12 和至少部分填充每个孔 14,如图 7 所示。而且,如在图 10 和图 11 的紧固装置的两个可选实施例中所阐述的,在步骤 26 中,金属沉积物 16 可完全填充所述至少一个孔 14。最后,在该相同步骤 26 中,金属沉积物 16 覆盖所述至少一个孔 14 的与所述至少一个凹槽 12 连通的端部相对的端部的肩部 19,以便阻止所述至少一个装饰物 13 相对于体部 18、18' 的任何运动。

[0071] 优选地,为了便于上述填充,通过在凹槽 12、孔 14 以及在合适的情况下在凹槽 20 中搅拌,即,通过实施电镀浴流体的强制移位,来强制进行电解质更新,以便防止在填充凹槽 12、孔 14 以及在合适的情况下凹槽 20 中出现任何问题。

[0072] 如上所述,根据色彩或更一般地所希望的视觉效果,在步骤 26 中沉积的金属材料包括金和 / 或铜和 / 或银和 / 或钨和 / 或铂和 / 或钯和 / 或镍。

[0073] 最后,在第六步骤 27 中,方法 21 以从体部 11、18、18' 的表面去除任何沉积物 16 以及在合适的情况下导电层 15 结束,使得沉积物仅留在每个凹槽 12 和孔 14 中,如图 8、图 10 和图 11 所示。因此,镶嵌元件 10 完成并且仅需要组装在最终部件中。上述步骤 27 可通过普通的表面方法例如磨削或研磨以去除多余的材料并随后进行抛光获得。

[0074] 根据本发明的方法 21 还可以具有可选择的用于沉积基本上透明的层的最终步骤,以便防止装饰物 13 老化。上述层例如可以包括氮化硅,以防止金属材料 16 以及在合适的情况下所述至少一层导电层 15 失去光泽,尤其是当它们主要由银基材形成时。

[0075] 当然,本发明并不限于示出的示例,而是包括对于本领域熟练技术人员来说是显而易见的各种变型和改动。尤其是,根据本发明的镶嵌元件 10 的应用决不限于钟表 1。因此,通过示例,镶嵌元件 10 可应用于珠宝首饰或甚至餐具。

[0076] 此外,在步骤 23 中形成凹槽 12 还可以与在步骤 24 中形成孔 14 转换,而不丧失本发明的优点。如果其精度和废品率可接受的话,还可以设想用其它类型的蚀刻替代在步骤 23 或步骤 24 中的激光蚀刻。

[0077] 最后,还应当指出,步骤 25 或 25' 并不限于化学镀或物理气相沉积,而是可选择例如通过化学气相沉积、原子层沉积法或离子轰击法实现。

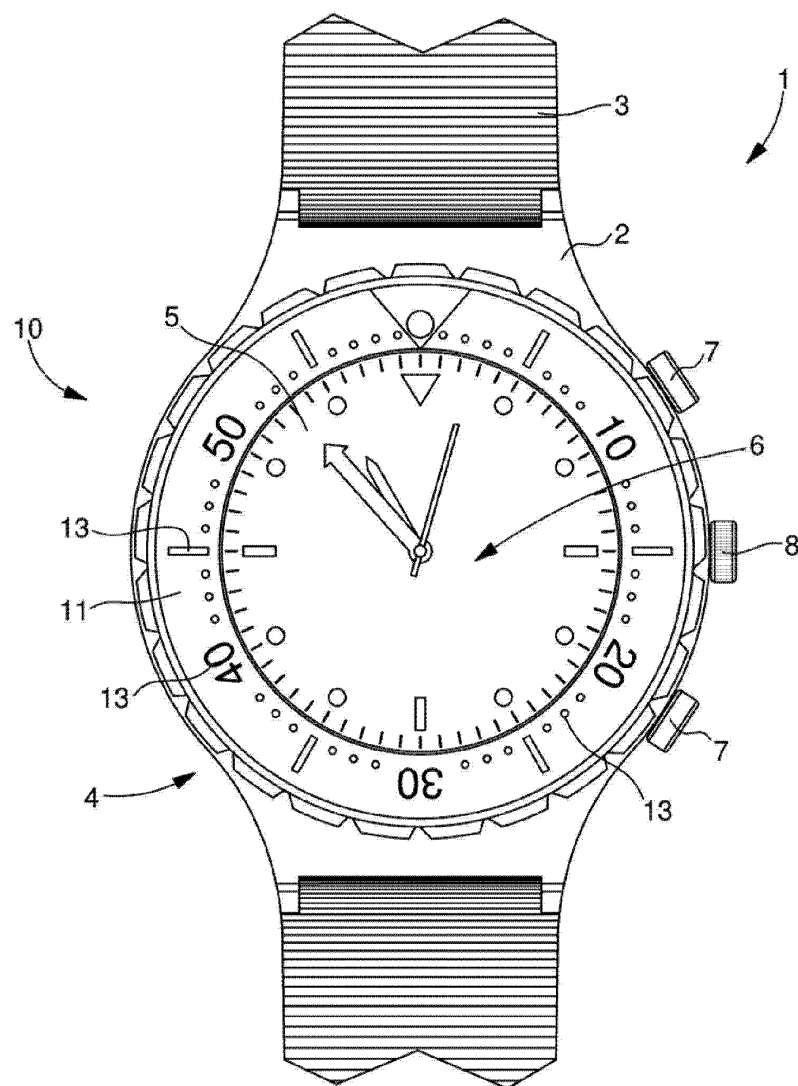
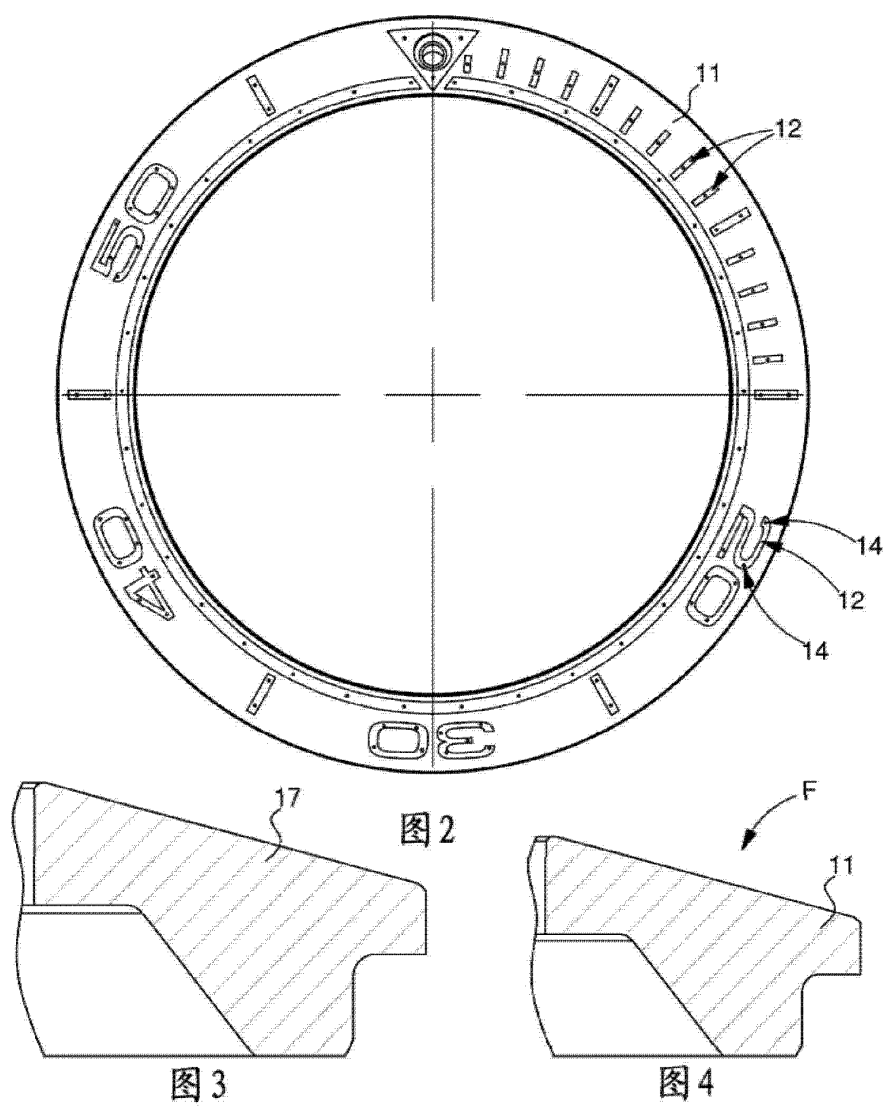


图 1



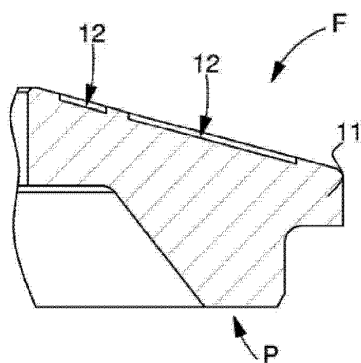


图 5

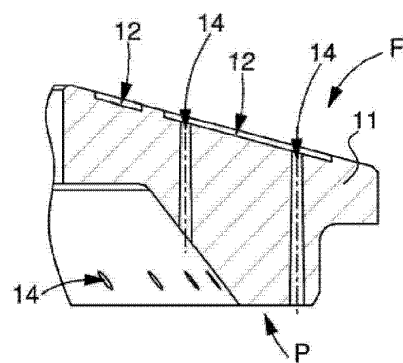


图 6

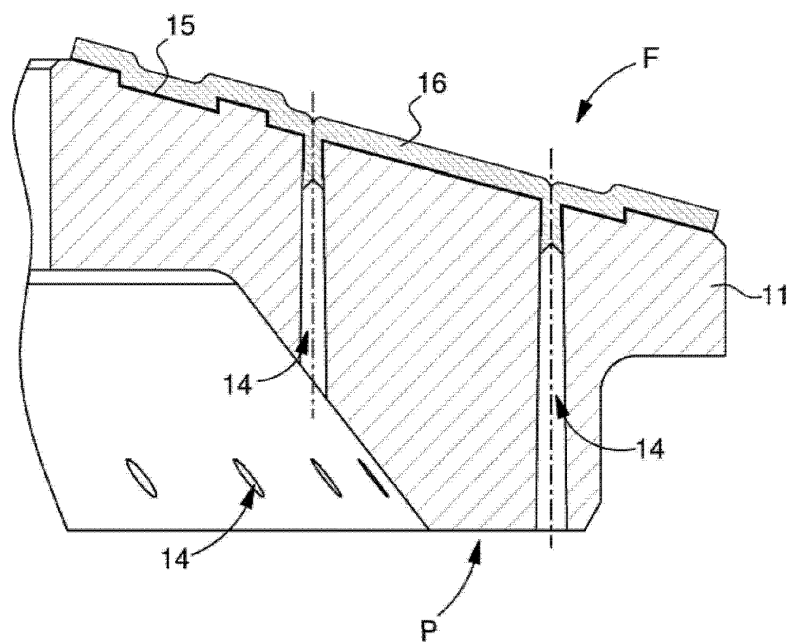


图 7

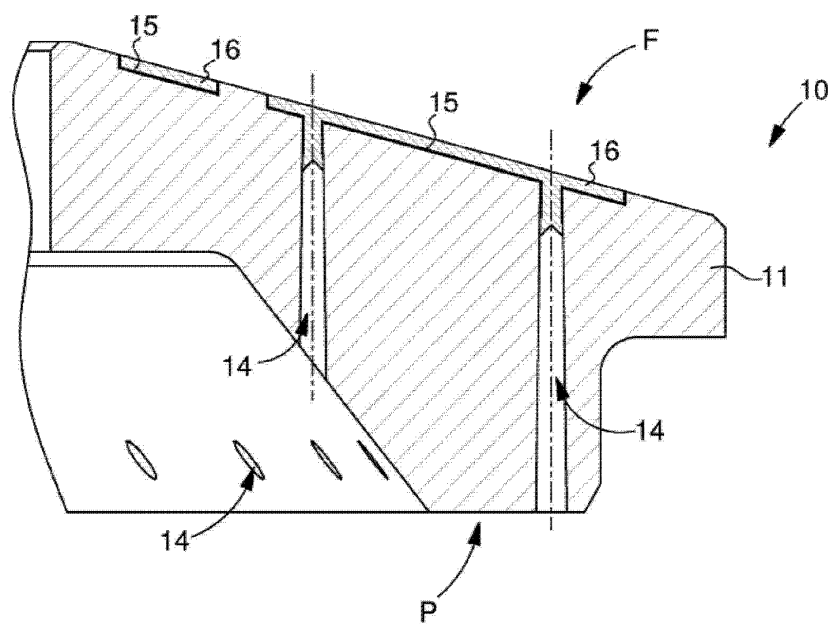


图 8

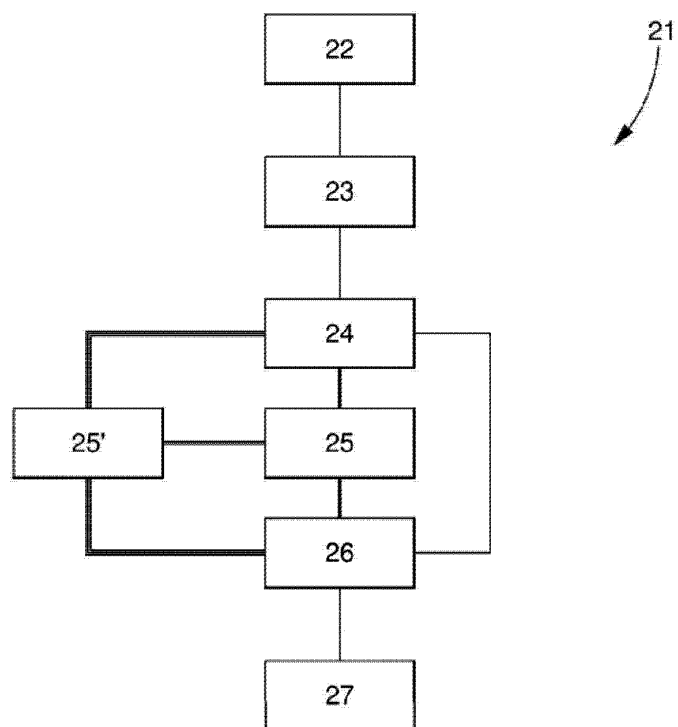


图 9

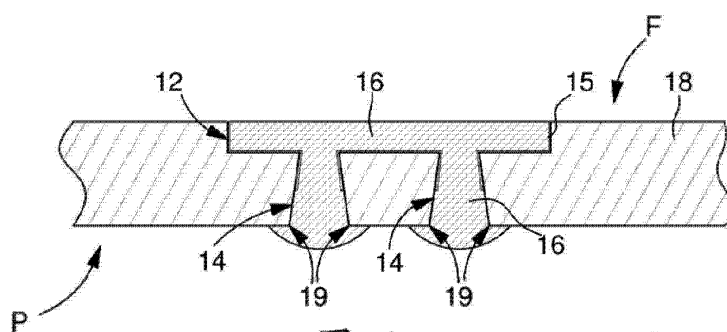


图 10

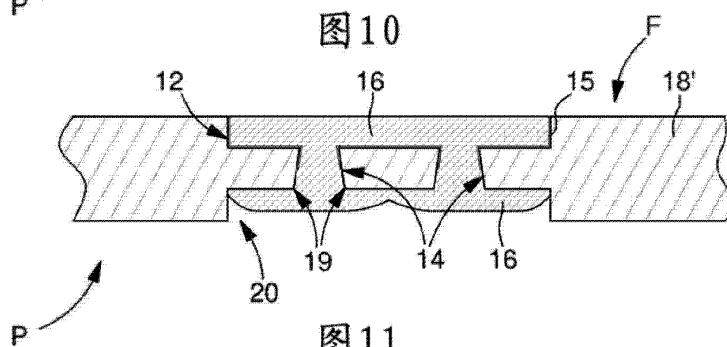


图 11



Espacenet

Bibliographic data: CN201081979 (Y) — 2008-07-09

Rotating jewel finger ring

Inventor(s): ZHANGJU TAO [CN] ± (TAO ZHANGJU)
Applicant(s): ZHANGJU TAO [CN] ± (TAO ZHANGJU)
Classification: - international: **A44C9/00**
- cooperative:
Application number: CN20072125799U 20070806
Priority number(s): CN20072125799U 20070806

Abstract of CN201081979 (Y)

The utility model discloses a rotary gemstone ring, which consists of a ring, a fine needle and a gemstone. An eyelet is arranged on the ring, and a decoration is mounted around the eyelet, clinging onto the ring. An orifice is set at the center of the gemstone without drilling through the gemstone. The internal diameters of the upper and end parts of the orifice are respectively about 0.1cm and 0.2cm. A flake, in which an eyelet with an internal diameter of 0.1cm or so is positioned, is mounted for sealing a bottom port of the orifice on the gemstone. A needle with a length of about 1cm and a thickness of about 0.05cm is set. A becket with an external diameter of 0.18cm or so is arranged 0.6cm apart from the needle tip. The gemstone can take the needle tip as a pivot to swing and rotate after threading the bottom end of the needle bar into the eyelet and securing the needle bar in the ring eyelet by glue or soldering tin.

[19] 中华人民共和国国家知识产权局

[51] Int. Cl.
A44C 9/00 (2006.01)



[12] 实用新型专利说明书

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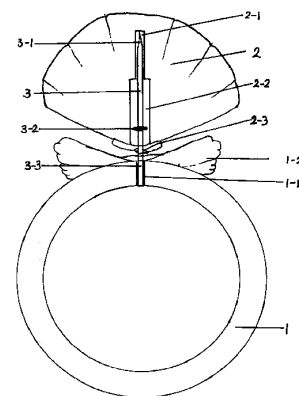
权利要求书 1 页 说明书 2 页 附图 1 页

[54] 实用新型名称

旋转宝石戒指

[57] 摘要

本实用新型公开了一种旋转宝石戒指，它由指环、细针和宝石组成，戒指指环上设置一小孔，小孔周围有装饰品紧贴指环上；宝石中间设置一小洞，小洞不穿透宝石，此小洞上端部分内径约 0.1cm，下端部分内径约 0.2cm；设置封闭宝石小洞底端口的薄片一小片，薄片有一内径约 0.1cm 的小孔；设置长约 1cm 粗约 0.05cm 的针一枚，离针尖约 0.6cm 处的针杆上套粘一环扣，环扣外径约 0.18cm。把针杆底端穿入小孔中，以胶或焊锡把针杆固定在指环小孔中，宝石以针尖为支点而摆动旋转。



1、一种旋转宝石戒指，由指环、细针和宝石组成，其特征是，指环上有一小孔，针杆上套粘一环扣，宝石中间有一小洞；小洞下端部分的内径略大于小洞上端部分的内径，宝石与指环的连接是：以针尖穿入宝石小洞中、针杆粘接于指环的小孔中。

旋转宝石戒指

技术领域

本实用新型涉及一种工艺品,尤其是涉及一种旋转宝石戒指。

背景技术

人们佩带的宝石戒指,皆是指环上镶嵌宝石,把宝石固定于指环之上,宝石不能在指环之上旋转摆动。

发明内容

为了克服以上技术之缺陷,本实用新型提供一种指环之上的宝石是能摆动旋转的旋转宝石戒指,使这种戒指更具魅力。

本实用新型所采用的技术方案为,本实用新型由指环、细针和宝石组成,其特征是,指环上有一小孔,针杆上套粘一环扣,宝石中间有一小洞;小洞下端部分的内径略大于小洞上端部分的内径,宝石与指环的连接是:以针尖穿入宝石小洞中、针杆粘接于指环的小孔中。戒指指环上设置一小孔,小孔内径约 0.1CM,小孔周围有装饰品紧贴指环上;宝石中间设置一小洞,小洞不穿透宝石,此小洞上端部分内径约 0.1CM,下端部分内径约 0.2CM;设置封闭宝石小洞底端口的薄片一小片,薄片有一内径约 0.1CM 的小孔;设置长约 1CM 粗约 0.05CM 的针一枚,离针尖约 0.6CM 处的针杆上套粘一环扣,环扣外径约 0.18CM。

本实用新型的有益效果是,宝石以细针连接于指环上,宝石

能以针尖为支点在指环上方而摆动旋转,更具魅力。

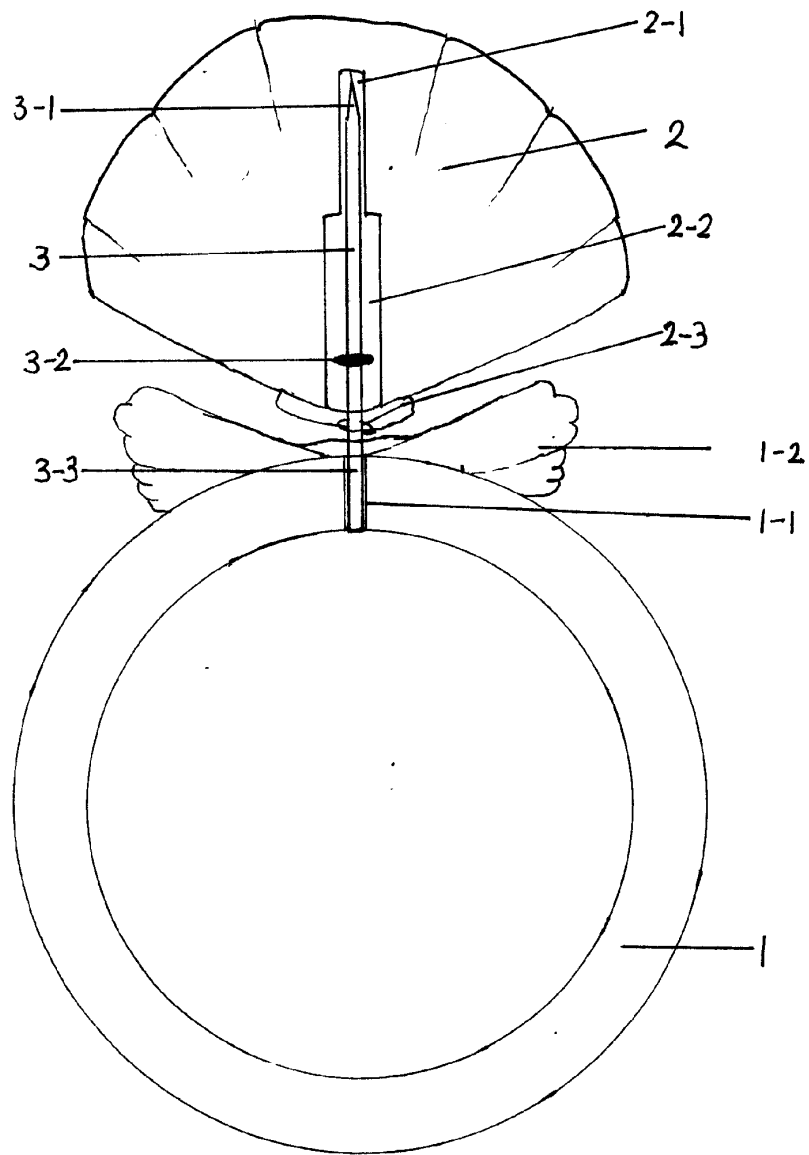
附图说明

附图是本实用新型的结构示意图。

图中, 1、指环; 1-1、指环上的小孔; 1-2、指环上的装饰品;
2、宝石; 2-1、小洞上端部分; 2-2、小洞下端部分; 2-3、封闭
小洞底端口的薄片上的小孔; 3、细针; 3-1、针尖; 3-2、环扣;
3-3、针杆。

具体实施方式

如图所示, 指环(1)上有小孔(1-1), 小孔周围设置了装饰品(1-2)并紧贴在指环上; 宝石(2)的上端小洞(2-1)细小, 下端小洞(2-2)稍大; 针杆(3-3)上套粘环扣(3-2), 把针尖(3-1)穿入宝石小洞上端(2-1), 针杆上的环扣(3-2)位于宝石下端小洞(2-2)中, 针杆(3-3)穿过薄片小孔(2-3), 薄片小孔粘贴在宝石(2)的底端, 环扣(3-2)被小孔(2-3)挡住不能脱落宝石小洞之外, 把针杆底端穿入小孔(1-1)中, 以胶或焊锡把针杆(3-3)固定在指环小孔(1-1)中, 指环戴在手指上, 指环随手指活动而活动, 这时宝石(2)以针尖(3-1)为支点而摆动旋转, 具有吸引人们欣赏的魅力。





Espacenet

Bibliographic data: CN202008579 (U) — 2011-10-12

Watch-head of stopwatch and stopwatch

Inventor(s): BEI LI; GONGQIAN CHEN; WANG LIAO ± (LI BEI, ; CHEN GONGQIAN, ; LIAO WANG)

Applicant(s): SHENZHEN FIYTA HOLDINGS LTD ± (SHENZHEN FIYTA HOLDINGS LTD)

Classification: - international: **G04B37/10**
- cooperative:

Application number: CN2011267885U 20110315

Priority number (s): CN2011267885U 20110315

Abstract of CN202008579 (U)

The utility model relates to a watch-head of a stopwatch and the stopwatch. The watch-head comprises a body provided with a first end connected with the crank shaft of the stopwatch, a second end opposite to the first end, and a metal decorative piece, the end surface of the second end is provided with an accommodating hole, the metal decorative piece is equipped with a basic shaft inserted into and fixed in the accommodating hole. The stopwatch is characterized by being equipped with the watch-head. By adopting two-stage structure in the watch-head, the second end of the body is provided with the metal decorative piece, processing head area of the watch-head is eliminated; the body and the metal decorative piece are processed separately, and then assembled, thus realizing diversity of processing process and complexity of decorative structure; further, nonmetal decorative pieces such as diamond can be inlaid on the metal decorative piece.



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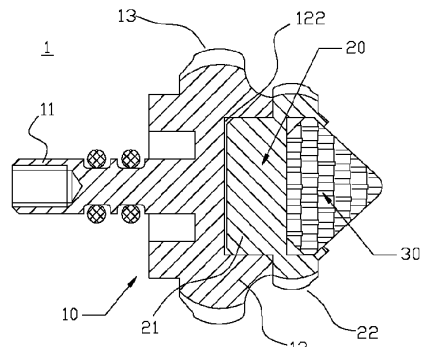
权利要求书 1 页 说明书 3 页 附图 2 页

(54) 实用新型名称

一种计时表的调时把的以及计时表

(57) 摘要

本实用新型涉及一种计时表的调时把的以及计时表,其调时把的包括调时把的本体,所述调时把的本体具有与计时表的柄轴连接第一端、以及与所述第一端相对的第二端,所述调时把的还包括一金属装饰件,所述第二端的端面设有一接纳孔,所述金属装饰件具有一基轴部,所述基轴部插入并固定在所述接纳孔中;其计时表在于具有上述调时把的。在本实用新型的调时把的中,由于采用两级结构,在调时把的本体的第二端设置有金属装饰件,可以消除调时把的的加工死角,先将调时把的本体以及金属装饰件进行单独加工,然后再组装起来,可以实现加工工艺的多样化,和装饰结构的复杂化,进一步还可以在金属装饰件上镶嵌诸如钻石之类的非金属装饰件。



1. 一种计时表的调时把的,包括调时把的本体,所述调时把的本体具有与计时表的柄轴连接第一端、以及与所述第一端相对的第二端,其特征在于,所述调时把的还包括一金属装饰件,所述第二端的端面设有一接纳孔,所述金属装饰件具有一基轴部,所述基轴部插入并固定在所述接纳孔中。
2. 根据权利要求1所述的调时把的,其特征在于,所述基轴部粘接在所述接纳孔内。
3. 根据权利要求1所述的调时把的,其特征在于,所述基轴部与所述接纳孔过盈配合。
4. 根据权利要求1至3任一项所述的调时把的,其特征在于,所述金属装饰件的外周具有向外凸出的第一圆弧面,所述第一圆弧面设有劈花。
5. 根据权利要求4所述的调时把的,其特征在于,所述金属装饰件的远离基轴部的一端镶有非金属装饰件。
6. 根据权利要求5所述的调时把的,其特征在于,所述非金属装饰件为钻石、红宝石、蓝宝石或锆石。
7. 根据权利要求6所述的调时把的,其特征在于,所述金属装饰件的远离基轴部的一端具有用于镶嵌所述非金属装饰件的凹坑,所述凹坑的端面具有在所述非金属装饰件放入所述凹坑后向内收缩将所述非金属装饰件固定在所述凹坑内的铆接凸圈。
8. 根据权利要求7所述的调时把的,其特征在于,所述非金属装饰件为钻石,所述钻石的锥面向外。
9. 根据权利要求8所述的调时把的,其特征在于,所述调时把的本体的第二端的外周具有向外凸出的第二圆弧面,所述第二圆弧面上设有劈花。
10. 一种计时表,所述计时表包括透明件以及壳体,所述透明件以及壳体构成一个收容有机芯的密封腔体,其特征在于,还包括如权利要求1至9任一项所述的调时把的,所述调时把的第一端与所述机芯的柄轴相连接。

一种计时表的调时把的以及计时表

技术领域

[0001] 本实用新型涉及计时表,更具体地说,涉及一种计时表的调时把的以及计时表。

背景技术

[0002] 计时表,例如腕表或怀表,通常都具有调时把的,调时把的与机芯的柄轴相连接,用于对机芯进行调节。计时把的也被称为表冠,露在壳体的外部,除了调节计时表的功能外,还兼有装饰的功能。现有的计时表的调时把的大多采用一体式结构,结构形式单一,外观造型简单,偏重于调时把的结构功能,而忽略了调时把的装饰功能。其原因在于,现有的调时把的结构自身限制了对调时把的加工,调时把的具有一些加工死角,难以加工出复杂的花纹结构。

实用新型内容

[0003] 本实用新型要解决的技术问题在于,针对现有技术的计时表的调时把的的上述缺陷,提供一种调时把的,具有两级结构,可以消除加工死角,加工出复杂的装饰结构。

[0004] 本实用新型解决其技术问题所采用的技术方案是:构造一种调时把的,包括调时把的本体,所述调时把的本体具有与计时表的柄轴连接第一端、以及与所述第一端相对的第二端,所述调时把的还包括一金属装饰件,所述第二端的端面设有一接纳孔,所述金属装饰件具有一基轴部,所述基轴部插入并固定在所述接纳孔中。

[0005] 在本实用新型所述的调时把的中,所述基轴部粘接在所述接纳孔内。

[0006] 在本实用新型所述的调时把的中,所述基轴部与所述接纳孔过盈配合。

[0007] 在本实用新型所述的调时把的中,所述金属装饰件的外周具有向外凸出的第一圆弧面,所述第一圆弧面设有劈花。

[0008] 在本实用新型所述的调时把的中,所述金属装饰件的远离基轴部的一端镶有非金属装饰件。

[0009] 在本实用新型所述的调时把的中,所述非金属装饰件为钻石、红宝石、蓝宝石或锆石。

[0010] 在本实用新型所述的调时把的中,所述金属装饰件的远离基轴部的一端具有用于镶嵌所述非金属装饰件的凹坑,所述凹坑的端面具有在所述非金属装饰件放入所述凹坑后向内收缩将所述非金属装饰件固定在所述凹坑内的铆接凸圈。

[0011] 在本实用新型所述的调时把的中,所述非金属装饰件为钻石,所述钻石的锥面向外。

[0012] 在本实用新型所述的调时把的中,所述调时把的本体的第二端的外周具有向外凸出的第二圆弧面,所述第二圆弧面上设有劈花。

[0013] 一种计时表,所述计时表包括透明件以及壳体,所述透明件以及壳体构成一个收容有机芯的密封腔体,其特征在于,还包括如权利要求 1 至 9 任一项所述的调时把的,所述调时把的第一端与所述机芯的柄轴相连接。

[0014] 实施本实用新型的计时表的调时把的以及计时表,具有以下有益效果:在本实用新型的调时把的中,由于采用两级结构,在调时把的本体的第二端设置有金属装饰件,可以消除调时把的的加工死角,先将调时把的本体以及金属装饰件进行单独加工,然后再组装起来,可以实现加工工艺的多样化,和装饰结构的复杂化,进一步还可以在金属装饰件上镶嵌诸如钻石之类的非金属装饰件。

附图说明

[0015] 下面将结合附图及实施例对本实用新型作进一步说明,附图中:

[0016] 图 1 是本实用新型的计时表的调时把的优选实施例的结构示意图;

[0017] 图 2 是本实用新型的计时表的调时把的优选实施例的分解示意图;

[0018] 图 3 是本实用新型的计时表的调时把的优选实施例的端面视图;

[0019] 图 4 是本实用新型的计时表的优选实施例的示意图。

具体实施方式

[0020] 为了对本实用新型的技术特征、目的和效果有更加清楚的理解,现对照附图详细说明本实用新型的具体实施方式。

[0021] 如图 1 至图 3 所示,为本实用新型的计时表的调时把的优选实施例的示意图,该调时把的 1 包括调时把的本体 10,该调时把的本体 10 具有与计时表的柄轴连接第一端 11、以及与第一端 11 相对的第二端 12,该调时把的 1 还包括金属装饰件 20,调时把的本体 10 的第二端 12 的端面 121 设有一接纳孔 122,金属装饰件 20 具有一基轴部 21,基轴部 21 插入并固定在接纳孔 122 中。基轴部 21 可以采用粘接的方式固定在接纳孔 122 内,也可以采用基轴部 21 与接纳孔 122 过盈配合的方式固定在接纳孔 122 内,优选过盈配合的方式,这种方式具有结构简单,固定牢固的优点,在本实施例中,即采用过盈配合的方式。调时把的本体 10 和金属装饰件 20 可以采用相同的材料,也可以采用不同的材料,以呈现不同的视觉效果。由于将调时把的 1 分为调时把的本体 10 和金属装饰件 20 两部分,可以分别对二者进行加工,消除了现有的整体式调时把的所存在的一些加工死角,可以进行多种工艺的加工,以获得更好的装饰效果。

[0022] 在本实施例中,金属装饰件 20 的外周具有向外凸出的第一圆弧面 22,第一圆弧面上设有劈花 221。调时把的 10 的第二端 12 的外周具有向外凸出的第二圆弧面 13,所述第二圆弧面 13 上设有劈花 131,这样可以在调时把的 1 的外端形成 2 级劈花结构,这是在现有的整体式调时把的上所难以实现的。

[0023] 在本实施例中,为了获得更好的装饰效果,进一步的,可以在金属装饰件 20 的远离基轴部 21 的一端镶嵌非金属装饰件 30,非金属装饰件 30 可以是钻石、红宝石、蓝宝石、锆石等,或其他天然宝石和人造宝石,不同的宝石的镶嵌结构会有所不同。为了方便非金属装饰件 30 的镶嵌,金属装饰件 20 的远离基轴部 21 的一端具有用于镶嵌非金属装饰件 30 的凹坑 23,该凹坑 23 的端面具有在非金属装饰件 30 放入该凹坑 23 后向内收缩将非金属装饰件 30 固定在凹坑 23 内的铆接凸圈 231。具体的,将非金属装饰件 30 放入凹坑 23 后,采用机械式连续断面微收口铆接工艺使铆接凸圈 231 向内收缩,将非金属装饰件 30 铆接在凹坑 23 内。

[0024] 在本实施例中,非金属装饰件 30 为钻石,采用反嵌的结构将钻石嵌入到金属装饰件 20 上,即采用钻石的锥面向外的镶嵌结构。

[0025] 本实施例的调时把的具有多级叠层组合式劈花,而且镶有钻石,金属装饰件 20 和调时把的本体 10 采用基轴式过盈压入配合,具有连接可靠,精度高,巧妙合理拆分,丰富了零件的加工手段,扩展了调时把的外观造型创意空间。钻石的镶嵌配以机械式连续断面微收口铆接工艺,保证了铆接过程不会伤及钻石,且钻石在镶钻托位对中好、平稳。

[0026] 如图 4 所示,为本实用新型的计时表的优选实施例,该计时表包括透明件 2 以及壳体 3,透明件 2 以及壳体 3 构成一个收容有机芯 4 的密封腔体,该计时表还包括上述实施例中的调时把的 1,调时把的 1 的第一端与机芯 4 的柄轴(未示出)相连接。

[0027] 上面结合附图对本实用新型的实施例进行了描述,但是本实用新型并不局限于上述的具体实施方式,上述的具体实施方式仅仅是示意性的,而不是限制性的,本领域的普通技术人员在本实用新型的启示下,在不脱离本实用新型宗旨和权利要求所保护的范围情况下,还可做出很多形式,这些均属于本实用新型的保护之内。

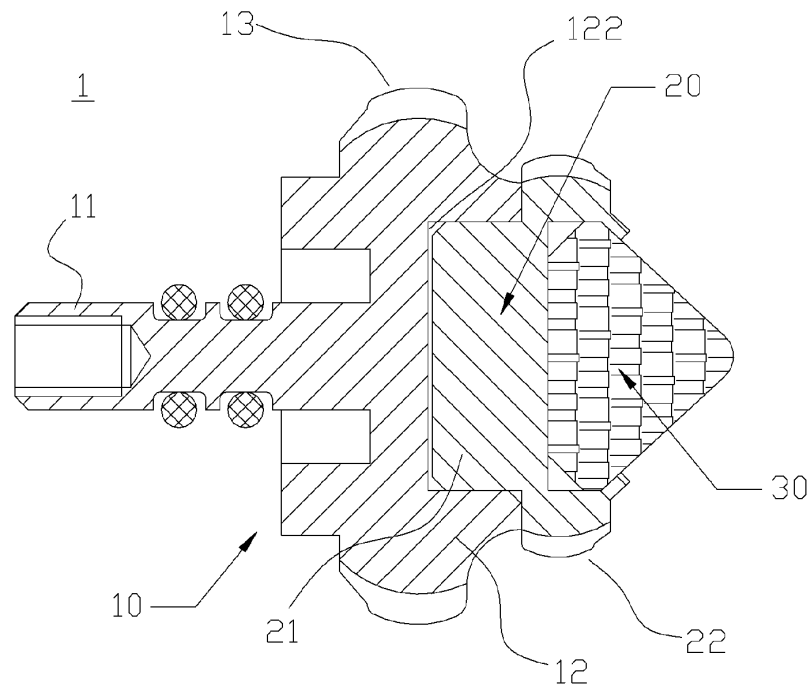


图 1

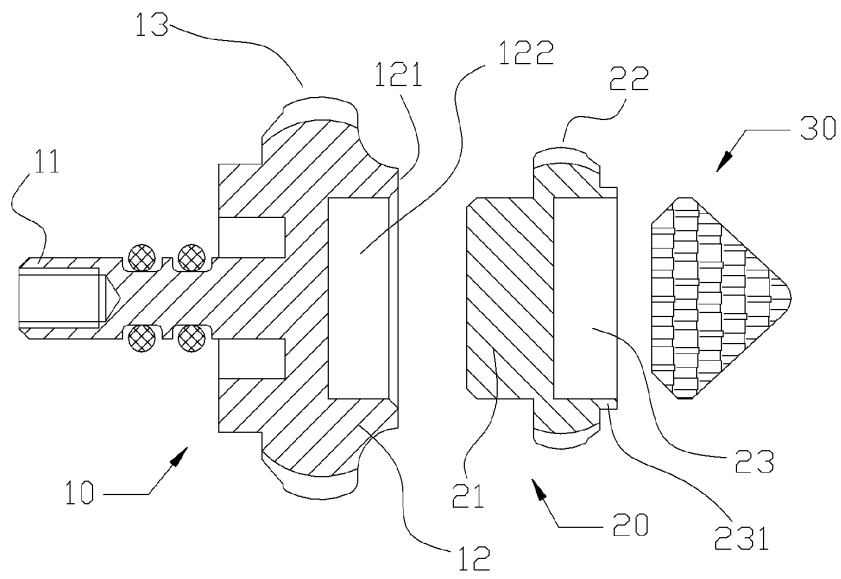


图 2

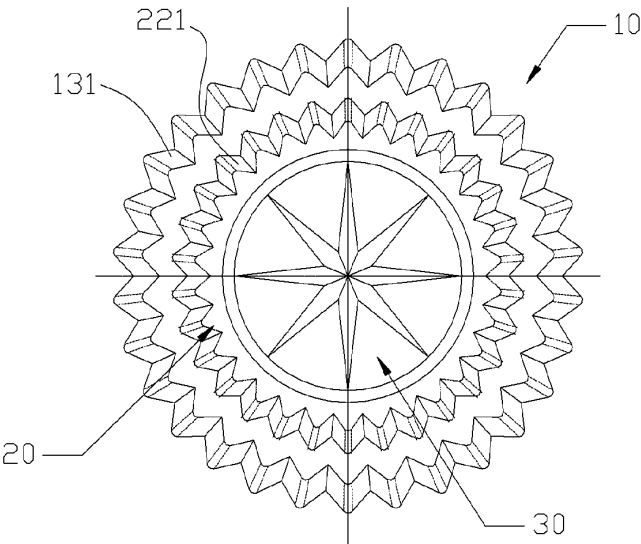


图 3

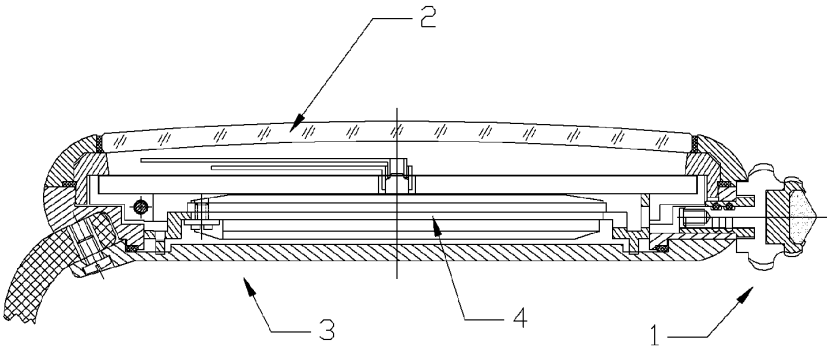


图 4



Espacenet

Bibliographic data: CN203630524 (U) — 2014-06-04

Watch structure

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Applicant(s): SENZHEN BOSHIHAO JEWELRY CO LTD ± (SENZHEN BOSHIHAO JEWELRY CO., LTD)
Classification: - international: G04B39/00
- cooperative:
Application number: CN20132717912U 20131113
Priority number (s): CN20132717912U 20131113

Abstract of CN203630524 (U)

The utility model relates to a watch structure. The watch structure comprises a shell and a movement arranged in the shell, wherein the shell comprises an outer ring, a surface cover, an inner ring and a bottom cover, the bottom cover is fixed below the inner ring, the inner ring is fixedly sleeved in the inner ring, the upper end of a through hole of the outer ring is provided with a flange protruding toward the inner part of the through hole, the flange and the top end of the inner ring form an annular clamping slot, and the outer edge of the surface cover is clamped in the clamping slot. According to the watch structure, the surface cover is clamped through matching the flange of the outer ring with the top end of the inner ring, and a surface cover bonding mode is replaced by a mechanical clamping mode, thereby enhancing the stability of the surface cover, enabling the surface cover not to loose or fall after being used for a long time, and improving the quality of a watch in use.

(19) 中华人民共和国国家知识产权局



(12) 实用新型专利



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(51) Int. Cl.

G04B 39/00 (2006.01)

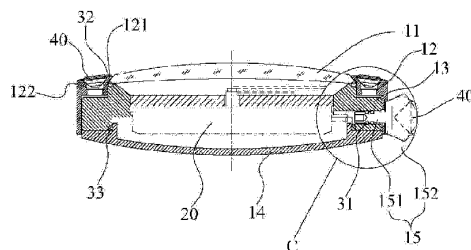
权利要求书1页 说明书3页 附图5页

(54) 实用新型名称

一种手表结构

(57) 摘要

本实用新型涉及一种手表结构。该手表结构包括外壳和设在外壳内的机芯，外壳包括外环、表盖、内圈和底盖，底盖固定在内圈下方，内圈固定套设于外环里面，外环的通孔的上端设有往通孔内凸起的凸缘，凸缘与内圈的顶端形成环形卡槽，表盖的外缘卡接在卡槽内。本实用新型通过外环的凸缘和内圈的顶端配合夹住表盖，通过机械夹紧的方式取代表盖粘接的方式，加强了表盖的稳固性，使得表盖在长时间使用后也不会出现松动或脱落的现象，改善了手表的使用质量。



CN 203630524 U

1. 一种手表结构,包括外壳和设在所述外壳内的机芯,其特征在于,所述外壳包括外环、表盖、内圈和底盖,所述底盖固定在内圈下方,所述内圈固定套设于外环里面,所述外环的通孔的上端设有往通孔内凸起的凸缘,所述凸缘与内圈的顶端形成环形卡槽,所述表盖的外缘卡接在卡槽内。
2. 如权利要求1所述的手表结构,其特征在于,所述外环的凸缘的下表面为斜面,所述表盖的外缘上表面设有对应所述斜面的斜坡,所述斜坡抵顶于所述斜面。
3. 如权利要求1所述的手表结构,其特征在于,所述外环的上表面设有凹腔,所述凹腔内镶嵌有宝石。
4. 如权利要求1所述的手表结构,其特征在于,所述外壳还包括一体成型的表把,所述表把包括相互固定连接的拉管和把头,所述拉管贯穿外环与内圈并连接机芯;所述把头的外侧镶嵌有宝石。
5. 如权利要求4所述的手表结构,其特征在于,所述拉管与内圈之间设有两条第一密封圈,所述第一密封圈套设在拉管的凹槽内。
6. 如权利要求1至5任一项所述的手表结构,其特征在于,所述外壳还包括壳耳,所述壳耳分布于底盖的周围并固定连接底盖。
7. 如权利要求6所述的手表结构,其特征在于,所述壳耳与底盖分别加工成型后装配固定成一体。
8. 如权利要求1至5任一项所述的手表结构,其特征在于,所述卡槽内设有第二密封圈,所述第二密封圈夹在表盖的外缘与内圈的顶端之间。
9. 如权利要求1至5任一项所述的手表结构,其特征在于,所述底盖与内圈之间设有第三密封圈。
10. 如权利要求9所述的手表结构,其特征在于,所述底盖设有U型槽,所述第二密封圈套设在U型槽内,所述内圈设有倾斜的下环面,所述下环面抵顶于第三密封圈。

一种手表结构

技术领域

[0001] 本实用新型涉及钟表,尤其涉及一种手表结构。

背景技术

[0002] 手表是人们日常生活用品,在市场上有五花八门的手表销售。多数的手表都是由壳体、底盖和透明的表盖组成,机芯设在表盖、壳体和底盖组成的密封空间里面。通常的手表结构中,表盖与壳体的连接分为两种:表盖与壳体粘贴;表盖通过过盈配合卡在壳体中。在手表使用了较长时间之后,这两种连接方式会出现不同程度的松动甚至掉落,影响了手表的使用质量。

实用新型内容

[0003] 本实用新型的目的在于为克服现有技术的缺陷,而提供一种手表结构,加强表盖的稳固性,改善手表的使用质量。

[0004] 为实现上述目的,本实用新型采用以下技术方案:

[0005] 一种手表结构,包括外壳和设在外壳内的机芯,外壳包括外环、表盖、内圈和底盖,底盖固定在内圈下方,内圈固定套设于外环里面,外环的通孔的上端设有往通孔内凸起的凸缘,凸缘与内圈的顶端形成环形卡槽,表盖的外缘卡接在卡槽内。

[0006] 进一步地,外环的凸缘的下表面为斜面,表盖的外缘上表面设有对应斜面的斜坡,斜坡抵顶于斜面。

[0007] 进一步地,外环的上表面设有凹腔,凹腔内镶嵌有宝石。

[0008] 进一步地,外壳还包括一体成型的表把,表把包括相互固定连接的拉管和把头,拉管贯穿外环与内圈并连接机芯;把头的外侧镶嵌有宝石。

[0009] 进一步地,拉管与内圈之间设有两条第一密封圈,第一密封圈套设在拉管的凹槽内。

[0010] 进一步地,外壳还包括壳耳,壳耳分布于底盖的周围并固定连接底盖。

[0011] 进一步地,壳耳与底盖分别加工成型后装配固定成一体。

[0012] 进一步地,卡槽内设有第二密封圈,第二密封圈夹在表盖的外缘与内圈的顶端之间。

[0013] 进一步地,底盖与内圈之间设有第三密封圈。

[0014] 进一步地,底盖设有U型槽,第三密封圈套设在U型槽内,内圈设有倾斜的下环面,下环面抵顶于第三密封圈。

[0015] 本实用新型与现有技术相比的有益效果是:

[0016] (1) 本实用新型通过外环的凸缘和内圈的顶端配合夹住表盖,通过机械夹紧的方式取代表盖粘接的方式,加强了表盖的稳固性,使得表盖在长时间使用后也不会出现松动或脱落的现象,改善了手表的使用质量。

[0017] (2) 本实用新型中外环的凸缘是通过斜面抵顶于表盖的斜坡,斜面对表盖的压力

分为指向下的力和指向中心的力,因此斜面既使得表盖固定,也能使的表盖往中心靠拢,避免表盖相对外环的中心偏移而影响外观。

[0018] (3) 本实用新型的外环和表把均镶嵌有宝石,改善了手表的外观和提高了手表的档次。

附图说明

- [0019] 图 1 为本实用新型实施例零件装配正视图
[0020] 图 2 为本实用新型实施例图 1 中 A-A 截面的剖视图
[0021] 图 3 为本实用新型实施例图 1 中 B-B 截面的剖视图
[0022] 图 4 为本实用新型实施例中外环与内圈装配的剖视图
[0023] 图 5 为本实用新型实施例中表盖的剖视图
[0024] 图 6 为本实用新型实施例中底盖与壳耳装配的剖视图
[0025] 图 7 为本实用新型实施例的图 1 中 O-F 截面的剖视图(O 为手表中心)
[0026] 图 8 为本实用新型实施例的图 2 中区域 C 的放大图
[0027] 图 9 为本实用新型实施例的图 7 中区域 D 的放大图
[0028] 图 10 为本实用新型实施例的图 7 中区域 E 的放大图

具体实施方式

[0029] 为了更充分理解本实用新型的技术内容,下面结合具体实施例对本实用新型的技术方案作进一步介绍和说明。

[0030] 本实用新型实施例的具体结构如图 1 至图 10 所示。本实施例的手表结构包括外壳和设在外壳内的机芯 20。外壳包括外环 12、表盖 11、内圈 13 和底盖 14。底盖 14 固定在内圈 13 下方。内圈 13 固定套设于外环 12 里面。具体地,内圈 13 与外环 12 是通过螺钉连接,而底盖 14 与内圈 13 也是通过螺钉连接。内圈 13 是钢制的,使得整个手表的手感显得厚重。外环 12 的通孔 123 的上端设有往通孔 123 内凸起的凸缘 121。凸缘 121 与内圈 13 的顶端形成环形卡槽 120,表盖 11 的外缘卡接在卡槽 120 内。

[0031] 如图 1 至图 7 所示,外环 12 的凸缘 121 的下表面为斜面 124。表盖 11 的外缘上表面设有对应斜面 124 的斜坡 111。斜坡 111 抵顶于斜面 124。

[0032] 如图 1 至图 7 所示,表盖 11 的横截面为圆弧形且其凸起方向指向上,这样的作用是可以放大手表的指针,方便看时间,同时也可以使得落在表盖 11 上的雨滴可以尽快排向两边,从而不会影响观察手表指针。表盖 11 为蓝宝石做成的透明玻璃。

[0033] 如图 1 至图 7 所示,外环 12 的上表面设有凹腔 122,凹腔 122 内镶嵌有宝石 40。外壳还包括一体成型的表把 15,这样可以使得手表结构更加紧凑。表把 15 包括相互固定连接的拉管 151 和把头 152。拉管 151 贯穿外环 12 与内圈 13 并连接机芯 20。把头 152 的外侧镶嵌有宝石 40。拉管 151 与内圈 13 之间设有两条第一密封圈 31。第一密封圈 31 套设在拉管 151 的凹槽 153 内。两条第一密封圈 31 使得表把 15 拉出来做调整的时候,还能保证有一条第一密封圈 31 起到密封作用,提高了手表的密封性能。

[0034] 如图 1 至图 7 所示,外壳还包括壳耳 16。壳耳 16 分布于底盖 14 的周围并固定连接底盖 14。壳耳 16 与底盖 14 分别加工成型后装配固定成一体。这样的结构相比壳耳 16

与底盖 14 一体加工的好处在于：壳耳 16 与底盖 14 连接的地方不会出现加工死角，手表的外观更美观、档次更高。

[0035] 如图 1 至图 7 所示，卡槽 120 内设有第二密封圈 32。第二密封圈 32 夹在表盖 11 的外缘与内圈 13 的顶端之间。底盖 14 与内圈 13 之间设有第三密封圈 33。底盖 14 设有 U 型槽 141。第三密封圈 33 套设在 U 型槽 141 内，第三密封圈 33 不容易移动，这可以使得拆装手表的时候更加的方便。内圈 13 设有倾斜的下环面 131，下环面 131 抵顶于第三密封圈 33。下环面 131 紧压住第三密封圈 33，并且下环面 131 是倾斜的，这样第三密封圈 33 受到的压力既有向下的力也有指向中心的力，使得第二密封圈 33 的密封性更加可靠。

[0036] 以上陈述仅以实施例来进一步说明本实用新型的技术内容，以便于读者更容易理解，但不代表本实用新型的实施方式仅限于此，任何依本实用新型所做的技术延伸或再创造，均受本实用新型的保护。

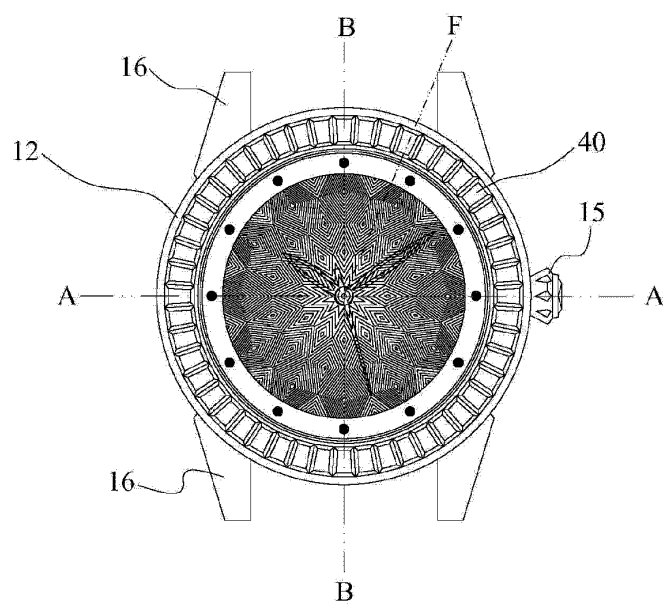


图 1

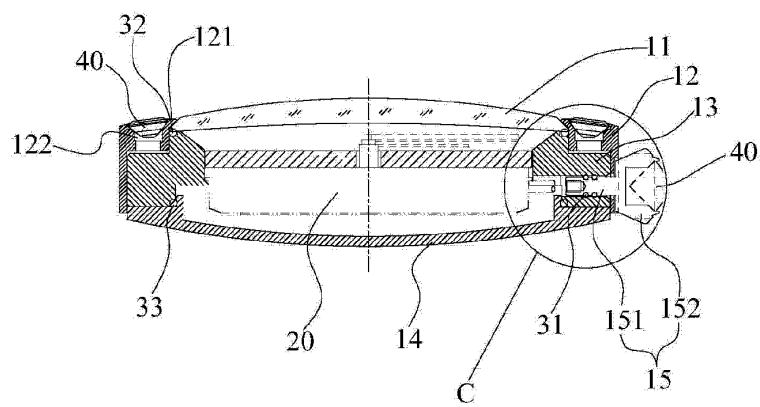


图 2

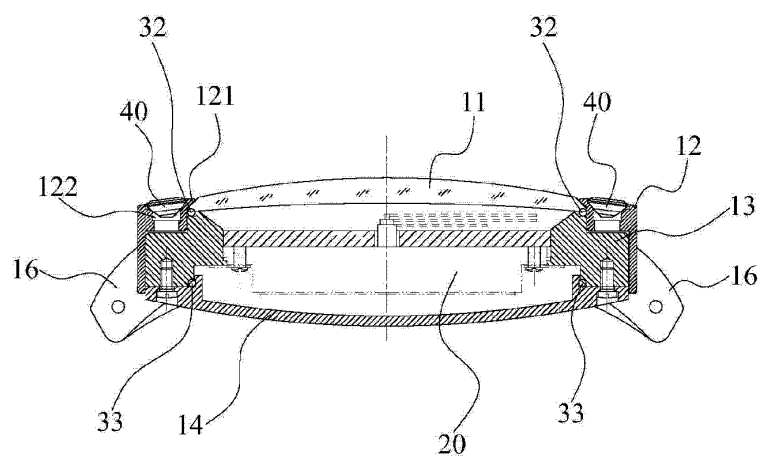


图 3

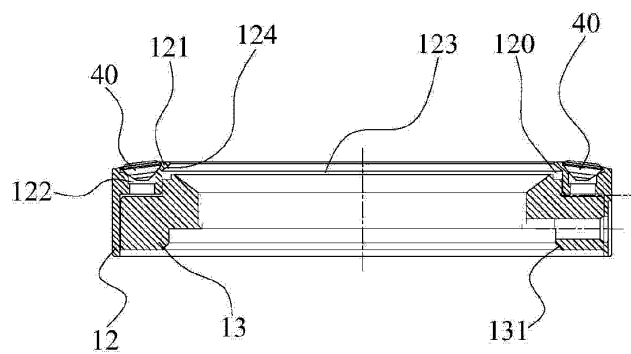


图 4

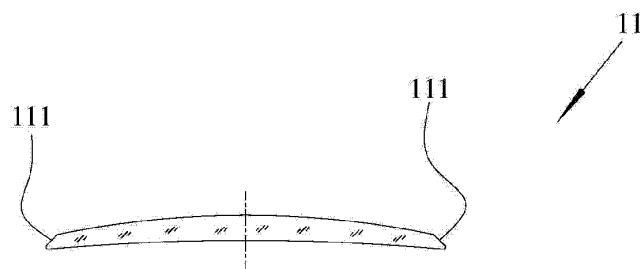


图 5

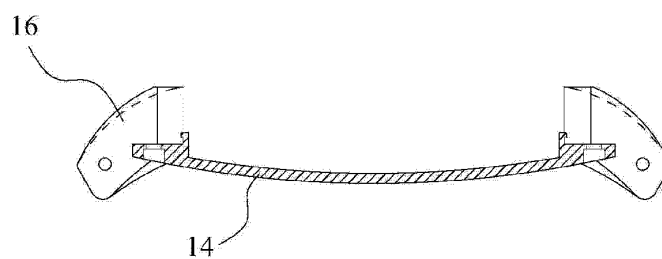


图 6

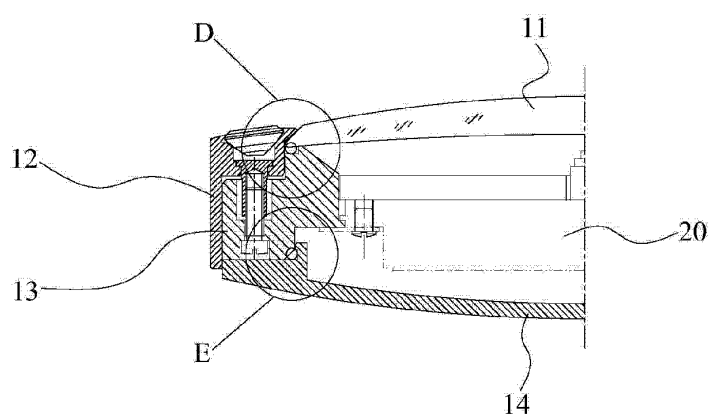


图 7

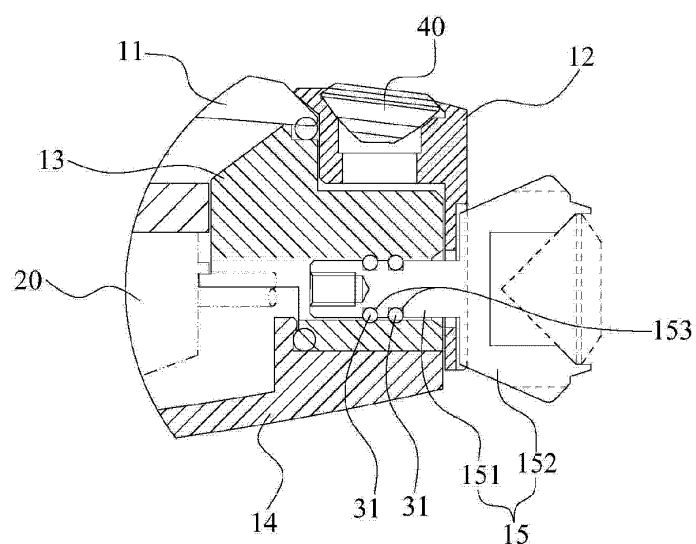


图 8

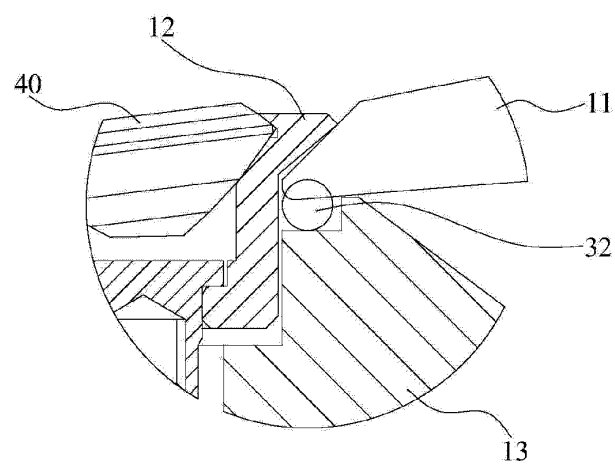


图 9

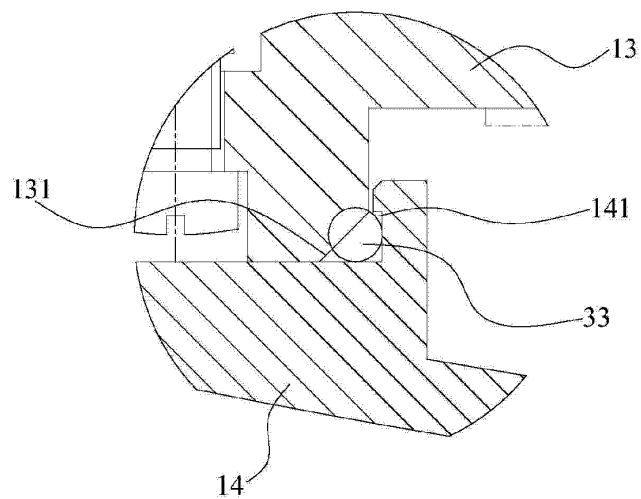


图 10



Espacenet

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METHOD OF AUTHENTICATING ELECTRONIC WATCH AND ELECTRONIC WATCH THAT INCORPORATES THE SAME

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KLOPFENSTEIN, ; EMMANUEL FLEURIE)

Applicant(s): ETA SA MFT HORLOGERE SUISSE ± (ETA SA MANUFACTURE
HORLOGERE SUISSE)

Classification: - international: **G04C3/00; G04G99/00**
- cooperative: **G04G21/00; G04G99/006**

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EP2579186 (B1) HK1185423 (A1) more

Abstract of JP2013079961 (A)

PROBLEM TO BE SOLVED: To provide an electronic watch authentication method which can be started up quickly to perform authentication checks of watches without using external equipment. ;SOLUTION: An electronic watch 1, which displays time using hands 6, 7, includes at least one processing and control circuit having a time base and means of storing personal data and/or identification data representing a brand and/or a serial number. For authentication, at least one of start-up sections 4, 4' connected to the processing and control circuit starts up to switch to authentication mode. When the start-up section is operable, an indicator device having the time hands visually shows watch authentication information. The hands 6, 7 move on a dial plate 5 to show each of a series of numbers or a number corresponding to an authentication code that is checked to authenticate the electronic watch 1. The hands 6, 7 are capable of following a specific trajectory on the dial plate 5 to authenticate the electronic watch 1. ;COPYRIGHT: (C)2013,JPO&INPIT;PROBLEM TO BE SOLVED: To provide an electronic watch authentication method which can be started up quickly to perform authentication checks of watches without using external equipment.SOLUTION: An electronic watch 1, which displays time using hands 6, 7, includes at least one

processing and control circuit having a time base and means of storing personal data and/or identification data representing a brand and/or a serial number. For authentication, at least one of start-up sections 4, 4' connected to the processing and control circuit starts up to switch to authentication mode. When the start-up section is operable, an indicator device having the time hands visually shows watch authentication information.; The hands 6, 7 move on a dial plate 5 to show each of a series of numbers or a number corresponding to an authentication code that is checked to authenticate the electronic watch 1. The hands 6, 7 are capable of following a specific trajectory on the dial plate 5 to authenticate the electronic watch 1.

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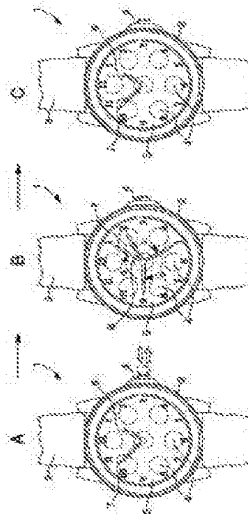
(51) Int.Cl. F I テーマコード (参考)
G04G 99/00 (2010.01) G04G 1/00 314Z 2F002
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最終頁に続く

(54) 【発明の名称】 電子時計の認証方法、およびこの方法を実施するための電子時計



[0001] 本発明は、電子時計を認証するための方法に関し、この電子時計は、モータ手段によって駆動する針を用いた時刻表示を有してもよい。この時計は特に、タイムベースと、個人データ、ならびに／または時計のブランドおよび／もしくはシリアルナンバーの識別データ、ならびに／または時計の動作パラメータを記憶する手段と、を備えた、少なくとも1つの処理および制御回路を含む。処理および制御回路は、例えばマイクロコントローラユニットであってもよい。

[0002] 本発明はまた、この時計認証方法を実装するための電子時計に関する。

[0003] 機械時計または電子機械時計の認証を可能にするために、時計は、特に製造中に、識別マークを付与することがある。この識別マークは、時計の魅力を低減しないよう、例えば、時計ケースの外側部分の、時計を手首に装着した時に直接見えないような部位に印字した、コードの形態であってもよい。このコードは例えば、特許文献1に定義してある2次元バーコードなど、コード化画像であってもよい。このコード化画像は、特定の計算アルゴリズムによって得られるものであるが、時計の識別子に基づいており、この時計識別子は一様に、時計識別子を記憶してあるカードによって販売される。このコードは、親会社から供給される復号キーを用いた復号操作によって復号してもよい。このため、時計を認証するためには特定の計算装置を用いる必要があり、これには時間がかかる上に複雑であるため、結果として欠点となる。

[0004] したがって、機械時計または電子機械時計は、個別にRFID回路チップを、時計ケースの内側に含むか、時計ケースの外側部分に隠してもよい。そして、識別コードはこのRFID回路チップに記憶され、近傍に設置してある装置を用いて、無線通信によってこの識別コードを読み取ることができる。このマークは、時計の出自の認証により、偽造に対する時計の保護を向上する。しかしながら、上記のように、時計識別データの読み取りおよび認証を可能にするためには特定の外部手段が必要となり、これは欠点となる。

[0005] 永久カレンダー時計を開示する特許文献2も、ここに引用することができる。この時計は、時刻指示用の針を備える。また、時計は、電子制御回路および時刻設定システムを含み、これらに対して、それぞれが特定の機能に關係しているいくつかの操作を行うことができる。時計ケース内の電子回路はコードを認識することができ、このコードは、時刻設定システムを用いて行われる特定の連続の操作に対応している。これにより、永久カレンダープログラムモード、特に、実行すべきプログラムモードへの切り替えが可能になる。電子回路は、プログラムモードへの切り替えのためのコードが正しく入力されたかどうかを識別することができる。しかしながら、この電子回路は、時計に関する識別情報を供給するために時計を動作させることはできない。

[0006] 特許文献3では、アナログまたはデジタル時計は、タイムベース部品に加えて、選択を表示装置に示すことにより、伝送するコードを選択する手段を含む。時計はさらに、電気光学的パーツを介してコードを伝送する手段を含

み、この電気光学的パーツはコードをバイナリ形式で表示する。電気光学的パーツによって伝送されたコードは、光電子処理装置で拾うことができる。上に示したように、コードの読み取りまたは時計の認証のために外部処理装置を用いる必要があり、これが欠点となる。

[0007] 【特許文献 1】 欧州特許第1804195 A1号

【特許文献 2】 仏国特許第2630228 A1号

【特許文献 3】 仏国特許第2486704 A1号

[0008] 本発明の主たる目的は、迅速に始動でき、かつ外部機器を用いずに時計の認証チェックができる、電子時計の認証のための方法を提供することによって、上述の欠点を克服することである。

[0009] したがって、本発明は、独立請求項1の特徴を有する、電子時計の認証のための方法に関する。

[0010] 認証方法の具体的なステップは、従属請求項2～9に定義されている。

[0011] 本発明による電子時計認証方法の1つの利点は、認証モードへの切り替えのために起動部を起動するとすぐに、時計に含まれる指示装置を始動できる、という事実である。この指示装置は、始動すると、認証情報を直接時計のユーザに提供し、時計の認証を証明することができる。指示装置は、視覚的、聴覚的、または特に振動エレメントによって触覚的に、認証情報を示すことができる。

[0012] 本発明によれば、時計の1つまたはいくつかの時刻指示用針で、指示装置の一部を形成することができる。これを達成するために、処理および制御回路を、モータ手段を制御するように構成およびプログラムする。このモータ手段は、起動部が始動して認証モードへの切り替えを行うと、1つまたは複数の針を駆動する。これにより、1つまたは複数の針は、時計を認証するために、時計の文字盤上で、ブランドおよび／または時計のシリアルナンバーの識別コードの少なくとも一部分の各数字または数を連続的に示すことができる。1つまたは複数の針はまた、時計識別に特化した回転動作を行うこともできる。1つまたは複数の針が文字盤上に示した識別コードの一部分は、時計の販売時に提供されたカードに記載されている識別コードと比較することができる。

[0013] したがって、本発明は、独立請求項10に定義した特徴を有する、認証方法を実装するための電子時計に関する。

[0014] 電子時計の具体的な実施形態は、従属請求項11～21に記載されている。

[0015] 認証方法を実装するための電子時計の1つの利点は、処理および制御回路によって時計を認証モードに切り替えるために、ある方法で起動される起動部を含む、という事実にある。これにより、起動部が起動されたときに時計が認証情報を提供するための回路によって、時計の指示装置を作動させることができる。この指示装置は、時計の文字盤上を動く1つもしくはいくつかの針、または1つもしくは2つの日付ディスク、または1つもしくはいくつかの光信号もしくは音声信号、または振動エレメントを含んでもよい。

[0016] 電子時計認証方法およびこの方法を実装するための時計の目的、利点、特徴については、図面を参照した以下の非限定的な説明によって一層明らかになるであろう。

[0018] 以下の説明において、時計認証方法を実装するための電子時計の、当業者に公知の全ての部品については、簡単にしか説明しない。以下の説明は主に、針を用いた時刻指示を行う電子時計についてのものであるが、この認証方法は、他のタイプの電子時計に適用することもできる。

[0019] 図11は、電子時計1の様々な電子エレメントを概略的に示しており、この実施形態では、電子時計11は、針6および7を用いて時刻指示を行う電子時計である。この電子時計はまた、時計ムーブメントの底板に垂直な軸の周り、例えば時計の中心軸の周りで回転可能に取り付けられた、少なくとも1つの日付ディスク8を含んでもよい。この日付ディスクを、時刻指示用の時計文字盤5の下に配置する。時計の通常動作モードでは、時刻指示用文字盤5の読み取り穴9を通して、日付ディスクの各数字または数が毎日連続して見える。

[0020] 電子時計11はまた、処理および制御回路11を含む。この処理および制御回路11は、好ましくはマイクロコントローラ処理ユニットおよび、タイムベースを定義するための、処理および制御回路の振動子段の水晶共振子13であってもよい。マイクロコントローラユニットは、例えば、スイスのEM Microelectronic-MarinがEM6812の名称で製造している、低電力8ビットCoo11RI S.Cマイクロコントローラを含ん

でもよい。

[0021] 電子時計1はさらに、針および日付ディスクを起動するための、例えば1つまたはいくつかのマイクロモータおよび様々な歯車で形成されるモータ手段10を含む。このモータ手段は、主として針6および7を時計文字盤5上で駆動するため、および日付ディスクを回転させるために、処理および制御回路で制御する。例えばクロノグラフ時計の場合、2つ以上の針を備えていてもよい。

[0022] 2つの日付ディスク8は、一方を他方の上、または一方を他方の下に取り付けてもよい。これらの日付ディスクをそれぞれ、時計文字盤に垂直なそれぞれ別の、または共通の軸の周りで回転可能に取り付けてもよい。これらの日付ディスクは、月日を指示するために、モータ手段10によって互いに独立して駆動してもよく、または互いに連関して駆動してもよい。

[0023] 電子時計1はさらに、処理および制御回路11および記憶手段12に接続された1つまたはいくつかの起動部4、4'を含む。起動部は、処理および制御回路11を介して、時計の様々な動作または機能の実行を制御するために配置されており、処理および制御回路11はこの目的のためにプログラムされている。記憶手段は、個人データ、ならびに/またはブランドおよび/もしくは特定の時計のシリアルナンバーの識別データ、ならびに時計の動作パラメータを記憶してもよい。時計のこれらの動作パラメータによって、処理および制御回路11は、時計の通常動作、また、以下に説明する時計認証の実行を制御できる。少なくとも1つの作動可能な起動部4、4'により、認証モードが起動されると、時計認証情報を視覚、聴覚、または触覚によって時計のユーザに示すために、指示装置が提供される。

[0024] 記憶手段は、部分的に不揮発性EEPROMメモリ12またはフラッシュメモリで形成してもよく、ブランドおよび/または時計のシリアルナンバーの1つまたはいくつかの識別コードを記憶する。公知の方法で、このタイプのメモリを、時計を製造して1つまたはいくつかの識別コードを記憶させた後の再プログラムを避けるために用いてもよい。これにより、時計の偽造がより困難になる。

[0025] 処理および制御回路11をマイクロコントローラ処理ユニットで形成する場合、記憶手段12を部分的または全体的に、このマイクロコントローラ処理ユニットに組み込むことができる。このマイクロコントローラユニットは、このユニットの動作プログラムを記憶するために、EEPROMまたはフラッシュメモリとは異なるタイプのメモリを含んでもよい。

[0026] 起動部4、4'は、例えば機用のステム/クラウン、押しボタン、時計のガラスまたは時計ケースの一部に配置した1つまたは複数の容量性タッチキー、およびベゼルによって形成してもよい。各起動部は、特定の動作または機能の実行を制御するために、処理および制御回路に電気的に接続されていてもよい。特定の機能の実行を制御するために、異なるタイプのいくつかの起動部を時計に配置してもよい。

[0027] 起動部がステム/クラウン4である場合、クラウンは第1の静止位置、および時計ケースの外側へと引き出された第2の位置を取ることができる。第1の静止位置において、クラウンのステムは、例えば処理および制御回路11の電気的接触を開閉することができる。しかし、時計ケースの外側へと引き出された第2の位置では、処理および制御回路の電気的接触が開く。結果として、処理および制御回路は、ステム/クラウンを起動することで電気的接触を開閉することにより、認証モードへ切り替わるように起動される。所定の時間間隔、例えば1〜4秒で、クラウンを引っ張って第2の外側位置にしたり、クラウンを押して第1の静止位置に戻したりして、処理および制御回路を認証モードに切り替える。

[0028] ステム/クラウンが第1の静止位置にある時に電気的接触が開くようにすることも想定可能であることに留意されたい。ステム/クラウンが時計ケースの外側へと引き出された第2の位置にある時、この目的で提供される電子処理および制御回路によって、この電気的接触を開閉することができる。

[0029] 起動部として、時計のガラスに接続して配置される衝撃センサ、または処理および制御回路に接続される磁気センサを提供してもよい。磁気センサは時計ケースの内側に配置されており、永久磁石によって起動することができる。この永久磁石は、電子時計のブレスレットまたはストラップ上にあってもよい。ブレスレットまたはストラップのバックルのトンガが、処理および制御回路を認証モードに切り替えるために、磁気センサを起動するための磁石であってもよい。

[0030] 処理および制御回路に接続されている、時計のバッテリーハウジング中のバッテリーを、起動部として提供してもよい。バッテリーはバッテリーハウジング中に電気的に接続されており、電子時計部品に電力を供給することができる。バッテリーをバッテリーハウジングから取り外し、すぐに戻すことによって、電気的初期化信号を処理および制御回路に供給することができる。この電気的初期化信号によって、処理および制御回路は時計認証モードに切り替わる。

[0031] 本発明による電子時計認証方法をより明確に説明するために、図2に、電子時計のための認証方法の様々なステ

ップを示している。この実施形態において、電子時計11は、時を表す数字マークを備える文字盤5上に、少なくとも2つの針6および7によって時刻を表示する。電子時計11は、時計ケース2に固定されたブレスレット3を含む。時計の起動部はステム/クラウン4および、互いに十分な距離を置いて時計のガラス上に配置された、いくつかの容量性タッチキー4'である。別のプッシュボタン（図示せず）またはステム/クラウンを使用して、タッチキーを始動することもできる。しかしながら、これらのタッチキーは常時作動可能であってもよい。これらのタッチキー4'は、認証モードを入力する、もしくはデータもしくは設定を入力する、または時計の異なるメニューもしくは機能を選択するために使用することができる。認証モードを入力するために、まず少なくとも1つのタッチキーに短く圧力をかけ、続いて長く圧力をかけること、またはいくつかのタッチキーを同時に起動することを想定することができる。

[0032] 図2に示した実施形態において、ステム/クラウン4は好ましくは、表時モードから時計認証モードへの切り替えに使用することができる。これを達成するために、および図2に符号Aで示したように、まず最初にステム/クラウン4を、第1の静止位置から第2の位置に、時計ケースの外側へと引き出さなければならない。これによって処理および制御回路に接続されている電気的接触が開く。次に、ステム/クラウン4を第2の位置から第1の静止位置へと押し戻し、処理および制御回路の電気的接触を再び閉じる。この動作は、図2に符号Aで示した表時モードから、図2に符号Bで示した認証モードへの切り替えを行うために、所定の時間間隔、例えば1〜4秒で行わなければならない。

[0033] 認証モードでは、少なくとも1つの針6または7が、時計を装着している人に時計認証情報を示す装置の一部を形成する。この認証情報は、少なくとも、ブランドおよび/または時計のシリアルナンバーの識別コードの一部であってもよい。好ましくは、2つの針6および7、またはクロノグラフ時計の3つの針を用いて、識別コードの少なくとも一部分の各数字または数を時計の装着者に視覚的に示すことができる。しかし、この目的のために、例えば分針または秒針など、1つの指示針だけで十分である場合もある。2つまたは3つの針を重ねて、処理および制御回路によって供給されるコマンドに基づいて、モータ手段によって一緒に駆動するようにしてもよい。

[0034] 重ねた針6および7をモータ手段で駆動し、文字盤5上の時刻指示用位置へと連続的に動かし、チェックする認証コードの連続する数字または数を示す。図2の符号Bにおいて、重ねた針6および7は、連続的に数2、5、9、1を示すように動くことで、所望の識別コード2591の一部を与える。針によって示した識別コードの一部分を、時計の販売時に提供されたカードに記載されているブランドおよび/または時計のシリアルナンバーの識別コードと比較することができる。1つの時計ブランドには単一の識別コードが提供されていてもよいが、シリアルナンバーを示す識別コードは製造された各時計で異なる。

[0035] 当然、2つの連続した数字または数が同一である場合、針は特定のやり方で文字盤上を動くことで、ユーザに、チェックする認証コードで同一の数字または数が連続することを示す。この場合、モータ手段は針を駆動して、例えば文字盤を完全に一周させてもよい。

[0036] ある時刻指示位置から別の時刻指示位置に切り替えるための時間間隔は、処理および制御回路にプログラムされている。針6、7が文字盤上に示した各数字または数をユーザが容易にチェックできるように、各切り替え時間を設定する。針が、時計を認証する数字または数を十分に示したら、所定の認証モード作動時間を終えて、モータ手段によって針を時刻指示状態にリセットする。通常4秒後に、処理および制御回路で制御されている針を、図2に符号Cで示したように、時刻を表示するようにモータ手段で駆動する。当然、認証モード作動時間によって生じるいかなる時刻の遅延も、マイクロコントローラユニットに組み込まれたカウンタによって、公知の方法で補正される。

[0037] 時計を認証するための実施形態において、少なくとも1つの針6もしくは7、または2つの重ねた針6、7を、起動部4、4'の各起動の後に、文字盤時刻指示位置に連続して動かす。これは、この目的のために提供された起動部の各起動の後に、チェックする時計のブランドおよび/またはシリアルナンバーの識別コードの連続した数字または数を起動部が示すことができる、ということの意味する。また、モータ手段で2つの針6、7を交互に動かし、チェックする時計のブランドおよび/またはシリアルナンバーの識別コードの連続した数字または数を個別に示すようにしてもよい。

[0038] 識別コードの数字指示を行う代わりに、認証モードでは、少なくとも1つの針6または7を文字盤上で回転させて、1つまたはいくつかの時計回りまたは反時計回り方向の回転運動をさせてもよい。また、1つまたは複数の針は、1周または何周かの周回運動を文字盤上でしてもよく、時計認証情報を提供するために所定の位置で停止する。

[0039] 指示装置を介して認証情報を提供するために、処理および制御回路で制御されたモータ手段で駆動される1つまたは2つの日付ディスクを用いてもよい。即ち、文字盤の穴を通して、認証対象の時計のブランドおよび/またはシリアルナンバーの識別コードの連続した数字または数を示すよう、1つまたは複数の日付ディスクを動かすことができる。日付ディスクを、互いに独立して回転するよう駆動してもよい。前述のように、1つまたは複数の日付ディスクを、この目的のために提供された起動部4、4'の各起動の後に、連続して動かしてもよい。これは、認

証対象の時計のブランドおよび／またはシリアルナンバーの識別コードの連続した数字または数を、文字盤の穴を通してユーザに起動部が示すことができることを意味している。

[0040] 電子時計1はさらに、様々なデータを表示するために、例えばLCDまたはLEDまたはOLED表示装置（図示せず）を含んでもよい。時計表示装置はまた、電子発光または電子ペーパーまたは電気泳動による表示であってもよい。この指示装置は、チェックする時計のブランドおよび／またはシリアルナンバーの識別コードの一部分を、連続的または瞬間的に表示することができる。

[0041] 例えば発光ダイオードを形成するいくつかの光源を、指示装置として提供してもよい。これらの光源は、起動部が認証モードへの切り替えに作動可能である時、処理および制御回路によって制御される。

[0042] 指示装置はまた、認証対象の時計の一連の識別用数字もしくは数、または認証対象の時計について特定の音楽を聴覚的に示すための、発音素子であってもよい。起動部が認証モードへの切り替えに作動可能である時に、処理および制御回路によってこの聴覚的指示装置を始動する。ユーザに聴覚的に示される一連の数字または数は、記憶手段に記憶されている。

[0043] 当業者なら、以上の説明から、請求項で定義する本発明の範囲から逸脱することなく、電子時計の認証方法およびこの方法を実装するための電子時計のいくつかの変形形態を考案することができる。触覚によって情報を生成する装置、例えば手首上の振動エレメントを、指示装置として用いてもよい。異なるタイプの指示装置、例えば聴覚的指示装置と聴覚的または光装置とを組み合わせてもよい。聴覚的または光装置による指示は、例えば時計の信頼性チェックのためのアプリケーションを装備した携帯電話などの機器を用いて、容易に理解することができる。時計を起動するためにいくつかのタイプの起動部を用いてもよく、これによって、時計は時計認証モードに切り替わる。クロノグラフ時計に関しては、秒針を用いることができ、秒針は中心に位置しており、時計の他の針の駆動とは独立して駆動することができる。

【請求項 1】

電子時計（1）を認証するための方法であって、

前記時計は、タイムベースと、個人データ、ならびに／または前記時計のブランドおよび／もしくは時計のシリアルナンバーの識別データ、ならびに／または前記時計の動作パラメータを記憶する手段（12）と、を備え、少なくとも1つの処理および制御回路（11）を含み、

前記方法が、

時計認証モードに切り替えるために前記処理および制御回路に接続されている、前記時計の少なくとも1つの起動部（4、4'）を作動可能にするステップと、

前記起動部を作動可能にした後に、指示装置を作動させ、視覚的、聴覚的、または触覚的に、前記時計のユーザに時計認証情報を示すステップと、

を含むことを特徴とする、方法。

【請求項 2】

前記電子時計（1）は、時刻を指示するための針（6、7）を有し、

前記針は、前記処理および制御回路（11）によって制御されるモータ手段（10）によって駆動され、

認証モードにおいて、前記針は前記指示装置の一部を形成し、

前記起動部が作動可能になると、前記針の少なくとも1つが前記モータ手段によって駆動され、時刻指示文字盤（5）上を動いて、時計認証情報を示すことを特徴とする、請求項1に記載の認証方法。

【請求項 3】

少なくとも1つの前記針（6）は、前記文字盤上の時刻指示位置に連続して動き、チェックする前記時計の前記ブランドおよび／またはシリアルナンバーの識別コードの連続した数字または数を示すことを特徴とする、請求項2に記載の認証方法。

【請求項 4】

認証モードにおいて、前記処理および制御回路（１１）は、前記モータ手段（１０）を作動させて、少なくとも１つの前記針（６）を、時刻指示位置から、所定の時間間隔後に連続した時刻指示位置へと動かして、示した各数字または数を前記ユーザがチェックできるようにするようにプログラムされていることと、

前記針は、所定の認証モード作動時間の後、前記モータ手段によって時刻指示状態にリセットされることと、を特徴とする、請求項３に記載の認証方法。

【請求項 5】

認証モードにおいて、少なくとも１つの前記針（６）は、前記起動部（４、４'）の各起動の後に、前記文字盤上の時刻指示位置に連続して動き、チェックする前記時計の前記ブランドおよび／またはシリアルナンバーの認証コードの連続した数字または数を示すことを特徴とする、請求項２に記載の認証方法。

【請求項 6】

少なくとも２つの前記針（６、７）は、前記モータ手段（１０）によって交互に動かされ、チェックする前記時計の前記識別コードの前記連続した数字または数を個別に示すことを特徴とする、請求項３または５に記載の認証方法。

【請求項 7】

少なくとも１つの前記針（６）は、前記文字盤（５）上で動かされて、１つまたはいくつかの時計回りまたは反時計回り方向の回転運動をするか、１周または何周かの周回運動を前記文字盤上でし、時計認証情報を提供するために所定の位置で停止することを特徴とする、請求項２に記載の認証方法。

【請求項 8】

前記電子時計（１）は、前記処理および制御回路（１１）で制御された前記モータ手段（１０）で駆動される、少なくとも１つの日付ディスク（８）を含み、

前記ディスクは、前記文字盤の穴（９）を通して表示される数字または数を備えた前記時計文字盤（５）の下に配置され、

認証モードにおいて、前記日付ディスクは前記指示装置の一部を形成し、

前記日付ディスクは、認証対象の前記時計の前記ブランドおよび／またはシリアルナンバーの識別コードの連続した数字または数を、前記文字盤の前記穴を通して示すように、動かされることを特徴とする、請求項１に記載の認証方法。

【請求項 9】

認証モードにおいて、前記日付ディスクは、前記起動部（４、４'）の各起動の後に、連続して動かされ、認証対象の前記時計の前記ブランドおよび／またはシリアルナンバーの識別コードの連続した数字または数を、前記文字盤の前記穴を通して示すことを特徴とする、請求項８に記載の認証方法。

【請求項 10】

請求項１～９のいずれか１項に記載の前記認証方法を実施するための電子時計（１）であって、

前記時計は、タイムベースと、個人データ、ならびに／または前記時計のブランドおよび／もしくは前記時計のシリアルナンバーの識別データ、ならびに／または前記時計の動作パラメータを記憶する手段（１２）と、を備えた、少なくとも１つの処理および制御回路（１１）を含み、

前記時計は、前記処理および制御回路に接続された少なくとも１つの起動部（４、４'）を含むことと、

前記メモリは、作動可能となると、認証モードにおいて、前記時計の認証のための情報を前記時計のユーザに視

覚的、聴覚的、または触覚的に示すことができる前記時計の指示装置を作動させることができることと、
を特徴とする、電子時計（１）。

【請求項 11】

前記電子時計（１）は、時刻を指示するための針（６、７）を有し、

前記針は、前記処理および制御回路（１１）によって制御されるモータ手段（１０）によって駆動され、

認証モードにおいて、前記針は前記指示装置の一部を形成し、前記針の少なくとも１つは、前記モータ手段によ
って駆動されるように配置され、時刻指示文字盤（５）上を動いて、時計認証情報を示すこと、

を特徴とする、請求項１０に記載の電子時計（１）。

【請求項 12】

前記モータ手段（１０）は、認証モードにおいて、前記処理および制御回路（１１）によって作動され、少な
くとも１つの前記針（６）を前記文字盤上の時刻指示位置へと駆動して、認証対象の前記時計の前記ブランドおよび
／またはシリアルナンバーの識別コードの前記数字または数を示すことを特徴とする、請求項１１に記載の電子時
計（１）。

【請求項 13】

認証モードにおいて、少なくとも２つの前記針（６、７）を重ねて、前記モータ手段（１０）によって一緒に駆
動されるようにし、認証対象の前記時計の識別コードの数字または数を示すようにすることを特徴とする、請求項
１２に記載の電子時計（１）。

【請求項 14】

前記電子時計（１）は、前記処理および制御回路（１１）で制御された前記モータ手段（１０）で駆動される、
少なくとも１つの日付ディスク（８）を含み、

前記ディスクは、前記文字盤の穴（９）を通して表示される数字または数を備えた前記時計文字盤（５）の下に
配置され、

認証モードにおいて、前記日付ディスクは前記指示装置の一部を形成し、

前記日付ディスクは、認証対象の前記時計のブランドおよび／またはシリアルナンバーの識別コードの連続した
数字または数を、前記文字盤の前記穴を通して示すように、前記モータ手段によって動かされるように配置される
ことを特徴とする、請求項１０に記載の電子時計（１）。

【請求項 15】

前記電子時計（１）は、前記モータ手段によって互いに独立して駆動することができる２つの前記日付ディス
クを含み、前記日付ディスクは、認証対象の前記時計の前記ブランドおよび／またはシリアルナンバーの識別コード
の連続した数字または数を、前記文字盤の前記穴（９）を通して示すことを特徴とする、請求項１４に記載の電子
時計（１）。

【請求項 16】

前記起動回路は、前記処理および制御回路（１１）の電気的接触が閉じるまたは開く第１の静止位置、および、前
記処理および制御回路の前記電気的接触が前記第１の静止位置とは逆に開くまたは閉じる、時計ケース（２）の外
側へと引き出された第２の位置を取ることができる、ステム／クラウン（４）であり、

前記処理および制御回路を、前記ステム／クラウンの起動による、前記電気的接触の開閉によって、認証モード
へと切り替わるように起動することを特徴とする、請求項１０に記載の電子時計（１）。

【請求項 17】

前記起動部は、時計ガラス上または前記時計ケースの一部上に配置された少なくとも1つの容量性タッチキー（4'）であり、

前記タッチキーは常時アクティブまたは作動可能であるように配置され、プッシュボタンまたは時刻設定システム／クラウン（4）を用いて、前記時計認証モードを起動することの特徴とする、請求項（10）に記載の電子時計（1）。

【請求項 18】

前記起動部は、前記時計のバッテリーハウジング中のバッテリーによって形成され、前記バッテリーは前記処理および制御回路（11）に接続されて電力を供給し、

前記バッテリーを前記バッテリーハウジングから取り外し、前記バッテリーハウジングに戻すことによって、電氣的初期化信号を前記処理および制御回路に供給して、時計認証モードに切り替えることができる

ことを特徴とする、請求項10に記載の電子時計（1）。

【請求項 19】

前記起動部は、前記処理および制御回路に接続された磁気センサによって形成され、

前記磁気センサは、前記時計のブレスレットまたはストラップ（3）に好ましくは配置した永久磁石を用いて作動可能となり、時計認証モードへと切り替えることを特徴とする、請求項10に記載の電子時計（1）。

【請求項 20】

前記起動部は、プッシュボタンまたは時計ベゼル、または時計ガラスの衝撃センサであり、前記プッシュボタンまたは前記時計ベゼル、または前記時計ガラスの前記衝撃センサは前記処理および制御回路（11）に電氣的に接続されることを特徴とする、請求項10に記載の電子時計（1）。

【請求項 21】

前記指示装置は、発音素子または振動エレメントまたは1つもしくは複数の光源から形成され、前記処理および制御回路（11）により制御されることを特徴とする、請求項10に記載の電子時計（1）。

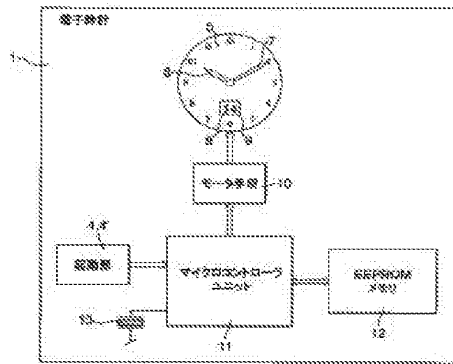
(57) 【要約】

【課題】迅速に始動でき、かつ外部機器を用いずに時計の認証チェックができる、電子時計の認証のための方法を提供する。

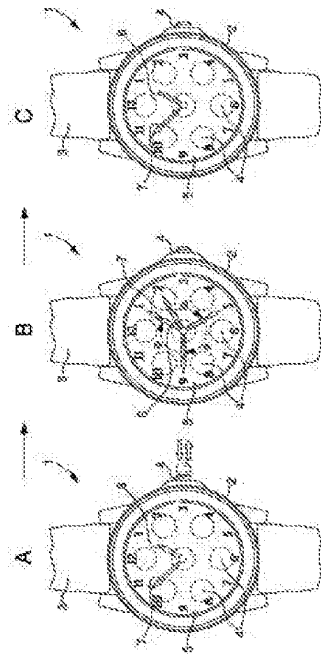
【解決手段】電子時計1は、針6、7を用いて時刻を表示するが、タイムベースと、個人データ、ならびに／またはブランドおよび／もしくはシリアルナンバーの識別データを記憶する手段と、を備えた、少なくとも1つの処理および制御回路を含む。認証方法に関して、処理および制御回路に接続された少なくとも1つの起動部4、4'は、認証モードに切り替わるように起動する。起動部が作動可能になると、時刻指示用針を含む指示装置は、時計認証情報を視覚的に示す。針6、7は文字盤上を動いて、電子時計1を認証するためにチェックされる識別コードの連続した各数字または数を示す。針6、7は、電子時計1を認証するために、文字盤上で特定の軌跡を描くことができる。

【選択図】 図2

【図 1】



【図 2】



11-10

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CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW。

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(54) Title: JADE WATCH

(54) 发明名称: 一种玉石手表

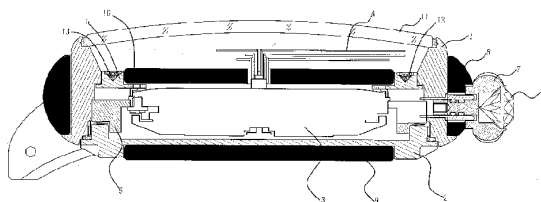


FIG. 1

(57) Abstract: A jade watch comprises a stainless steel watch case (1), a stainless steel watch bottom (2), a movement (3) disposed in the stainless steel watch case (1), watch hands (4) disposed in the movement (3), a watch dial (5) provided between the watch hands (4) and the movement (3), a stainless steel fixing cover disposed in the watch case (1) used for fixing the movement (3), and a stainless steel crown (7) connected with the watch case (1). A jade ring (8) which has the same axle with the watch case (1) is embedded in the outer circumference of the case, a watch bottom jade slice (9) is embedded in the stainless steel watch bottom (2), and a watch dial jade slice (10) is embedded in the watch dial (5). The edge of a jewel watch cover (11) is provided on the embedding shoulder in the upper end inner surface of the stainless steel watch case (1), and a sealed space is formed between the jewel watch cover (11) and the stainless steel watch case (1). A jewel (12) is embedded in the end of the stainless steel crown (7). The jade watch has good decorative effect and health-care function.

[见续页]

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(57) 摘要:

一种玉石手表，包括不锈钢表壳（1）、不锈钢表底（2）、设于不锈钢表壳（1）内的机芯（3）、设于机芯（3）上的表针（4）、设于表针（4）与机芯（3）之间的表盘（5）、设于表壳（1）内用于固定机芯（3）的不锈钢固机罩（6）、和与表壳（1）相连接的不锈钢表冠（7），所述表壳（1）的外圆周上嵌设有同轴的玉圈（8），不锈钢表底（2）内嵌设有表底玉片（9），表盘（5）内设有表盘玉片（10），一宝石表盖（11）的边缘设于不锈钢表壳（1）的上端的内表面的镶嵌台上，所述宝石表盖（11）与不锈钢表壳（1）形成封闭空间，所述不锈钢表冠（7）的末端镶嵌有宝石（12）。该玉石手表具有较好的装饰效果及保健作用。

一种玉石手表

技术领域

本实用新型涉及一种手表，尤其涉及一种采用玉石为材料制成的手表。

背景技术

作为一种计时工具，手表得到了广泛的运用，同时，也作为一种身份和财富的象征，奢侈、豪华型手表得到了达官贵人的青睐，无论是作为普通的计时工具还是奢侈品，手表大都采用金属作为材料制成，即使是用于彰显身份的奢侈型手表相对于普通手表而言，也是采用金属材料制成，只是做工更精细，并镶嵌贵重金属而已，但这类手表除了作为看看时间的工具和彰显身份外，对人体并无任何益处。

实用新型内容

本实用新型的主要目的在于提供一种与人体接触的部位采用玉石材料制成，具有装饰及保健功能玉石手表。

为了达到上述目的，本实用新型所采用的技术方案为：一种玉石手表，包括不锈钢表壳、不锈钢表底，设于不锈钢表壳内的机芯，设于机芯上的表针，设于表针与机芯之间的表盘，设于表壳内用于固定机芯的不锈钢固机罩，与表壳相连接的不锈钢表冠，所述表壳的外圆周上嵌设有同轴的玉圈，不锈钢表底内嵌设有表底玉片，表盘内设有表盘玉片，一宝石表盖的边缘设于不锈钢表壳的上端的内表面的镶嵌台上，所述宝石表盖与不锈钢表壳形成封闭空间，所述不锈钢表冠的末端镶嵌有宝石。

优选地，所述宝石表盖由蓝宝石制成。

优选地，所述不锈钢表冠末端镶嵌的宝石为红宝石。

优选地，所述表底玉片、表盘玉片、玉圈由玉石或翡翠或宝石制成。

优选地，所述表盘的两端靠近端部的上表面内均嵌设有宝石，所述宝石的顶部表面位于表盘5的嵌设宝石的下沉座内。

采用上述结构后，在与人体接触的部位以及显眼的位置均采用玉石材料制成，具有强烈的玉石质感，因此具备良好的装饰作用，而且，玉石本

身对人体具有保健作用,因此本实用新型具有较好的装饰效果及保健作用。

附图说明

图 1 为本实用新型的剖视图。

具体实施方式

为了使本实用新型的目的、技术方案及优点更加清楚明白,以下结合附图及实施例,对本实用新型进行进一步详细说明。应当理解,此处所描述的具体实施例仅仅用以解释本实用新型,并不用于限定本实用新型。

请参考图 1 所示,本实用新型公开了一种玉石手表,包括不锈钢表壳 1、不锈钢表底 2,设于不锈钢表壳 1 内的机芯 3,设于机芯 3 上的表针 4,设于表针 4 与机芯 3 之间的表盘 5,设于表壳 1 内用于固定机芯 3 的不锈钢固机罩 6,与表壳 1 相连接的不锈钢表冠 7。

所述表壳 1 的外圆周上嵌设有同轴的玉圈 8,不锈钢表底 2 内嵌设有表底玉片 9,作为腕表使用时,则表底玉片 9 刚好与人体皮肤相接触,表盘 5 内设有表盘玉片 10,一宝石表盖 11 的边缘设于不锈钢表壳 1 的上端的内表面的镶嵌台上并固定在不锈钢表壳 1 上,所述宝石表盖 11 与不锈钢表壳 1 形成封闭空间,所述不锈钢表冠 7 的末端镶嵌有宝石 12。

在本实施例中,所述宝石表盖 11 由蓝宝石制成。

在本实施例中,所述不锈钢表冠 7 末端镶嵌的宝石 12 为红宝石。

在本实施例中,所述表底玉片 9、表盘玉片 10、玉圈 8 均由玉石制成,但采用翡翠或宝石等类似质地的材料均可以达到玉石的效果,而且生产的工艺基本一致。

所述表盘 5 的两端靠近端部的上表面内均嵌设有宝石 13,所述宝石 13 的顶部表面位于表盘 5 的嵌设宝石的下沉座内,透过透明的宝石表盖 11 可以看到宝石 13 的顶部表面,从而减少了玉石手表的金属质感,增强玉石或宝石之感。

以上所述,仅为本实用新型较佳的具体实施方式,但本新型的保护范围并不局限于此,任何熟悉本技术领域的技术人员在本实用新型揭露的技术范围内,可轻易想到的变化或替换,都应涵盖在本实用新型的保护范围

之内。因此，本实用新型的保护范围应该以权利要求的保护范围为准。

权利要求书

1、一种玉石手表，包括不锈钢表壳、不锈钢表底，设于不锈钢表壳内的机芯，设于机芯上的表针，设于表针与机芯之间的表盘，设于表壳内用于固定机芯的不锈钢固机罩，与表壳相连接的不锈钢表冠，其特征在于，所述表壳的外圆周上嵌设有同轴的玉圈，不锈钢表底内嵌设有表底玉片，表盘内设有表盘玉片，一宝石表盖的边缘设于不锈钢表壳的上端的内表面的镶嵌台上，所述宝石表盖与不锈钢表壳形成封闭空间，所述不锈钢表冠的末端镶嵌有宝石。

2、如权利要求1所述的一种玉石手表，其特征在于，所述宝石表盖由蓝宝石制成。

3、如权利要求1所述的一种玉石手表，其特征在于，所述不锈钢表冠末端镶嵌的宝石为红宝石。

4、如权利要求1所述的一种玉石手表，其特征在于，所述表底玉片、表盘玉片、玉圈由玉石或翡翠或宝石制成。

5、如权利要求1所述的一种玉石手表，其特征在于，所述表盘的两端靠近端部的上表面内均嵌设有宝石，所述宝石的顶部表面位于表盘的嵌设宝石的下沉座内。



图 1

1/1

替换页（细则第26条）

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/070165

A. CLASSIFICATION OF SUBJECT MATTER

See Extra Sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G04B 45,G04B 37,G04B 39,G04C 23, G04G 17 FT: 2F002/AC04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI,CNABS,CNXTX,VEN: watch, timepiece, time display, jade, jadite, jadeite, stone, boulder, sapphire, emerald, embed, health

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN2886625Y(ZHANG,Xiaoping) 4 Apr.2007(04.04.2007) Page 1 Line 20 to Page 3 Line 9 in the description, figures 1-2	1-5
Y	CN201138428Y(KONG,Lingjun) 22 Oct.2008(22.10.2008) Page 2 Lines 6-21 in the description, figure 2	1-5
Y	CN1955865A(RADO MONTRES SA) 2 May 2007(02.05.2007) Page 4 Paragraph 2, Page 6 Paragraph 3, figure 3	5
A	CN201149642Y(LIU, Pengju) 12 Nov.2008(12.11.2008) the whole document	1-5
A	JP2008089533A(CITIZEN WATCH CO LTD) 17 Apr.2008(17.04.2008) the whole document	1-5
A	KR200186165Y (JANG BYONG YONG) 15 Jun.2000(15.06.2000) the whole document	1-5

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&”document member of the same patent family

Date of the actual completion of the international search
19 Sep.2011(19.09.2011)

Date of mailing of the international search report
20 Oct. 2011 (20.10.2011)

Name and mailing address of the ISA/CN
The State Intellectual Property Office, the P.R.China
6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China
100088
Facsimile No. 86-10-62019451

Authorized officer
SU,Aihua
Telephone No. (86-10)62085747

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2011/070165

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN2886625Y	04.04.2007	NONE	
CN201138428Y	22.10.2008	NONE	
CN1955865A	02.05.2007	EP1780615A1	02.05.2007
		JP2007121303A	17.05.2007
		SG131863A1	28.05.2007
		US2007109918A1	17.05.2007
		KR20070045926A	02.05.2007
		TW200736863A	01.10.2007
		US7755977B2	13.07.2010
		EP1780616A	02.05.2007
CN201149642Y	12.11.2008	NONE	
JP2008089533A	17.04.2008	NONE	
KR200186165Y	15.06.2000	NONE	

Form PCT/ISA /210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/070165

CLASSIFICATION OF SUBJECT MATTER

G04B 45/00 (2006.01) i

G04G 17/00 (2006.01) i

Form PCT/ISA /210 (extra sheet) (July 2009)

国际检索报告

国际申请号
PCT/CN2011/070165

A. 主题的分类

参见附加页

按照国际专利分类(IPC)或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

IPC: G04B 45,G04B 37,G04B 39,G04C 23, G04G 17 FT: 2F002/AC04

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称, 和使用的检索词(如使用))

CNKI,CNABS,CNTXT,VEN: 手表, 腕表, 時計, 计时器, 记时器, 时间显示装置, 玉, 石, 宝石, 翡翠, 嵌, 镶, 健康, 保健, watch, timepiece, time display, jade, jadeite, jadeite, stone, boulder, sapphire, emerald, embed, health

C. 相关文件

类 型*	引用文件, 必要时, 指明相关段落 m	相关的权利要求
Y	CN2886625Y(张孝平) 4.4 月 2007 (04.04.2007) 说明书第 1 页第 20 行-第 3 页第 9 行, 图 1-2	1-5
Y	CN201138428Y(孔令俊) 22.10 月 2008 (22.10.2008) 说明书第 2 页第 6 行-21 行, 图 2	1-5
Y	CN1955865A(蒙特雷斯拉多股份有限公司) 2.5 月 2007 (02.05.2007) 说明书第 4 页第 2 段, 第 6 页第 3 段, 图 3	5
A	CN201149642Y(刘鹏举) 12.11 月 2008 (12.11.2008) 全文	1-5
A	JP2008089533A(CITIZEN WATCH CO LTD) 17.4 月 2008 (17.04.2008) 全文	1-5
A	KR200186165Y (JANG BYONG YONG) 15.6 月 2000 (15.06.2000) 全文	1-5

☐ 其余文件在 C 栏的续页中列出。

☒ 见同族专利附件。

* 引用文件的具体类型:

“A” 认为不特别相关的表示了现有技术一般状态的文件

“E” 在国际申请日的当天或之后公布的在先申请或专利

“L” 可能对优先权要求构成怀疑的文件, 或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件(如具体说明的)

“O” 涉及口头公开、使用、展览或其他方式公开的文件

“P” 公布日先于国际申请日但迟于所要求的优先权日的文件

“T” 在申请日或优先权日之后公布, 与申请不相抵触, 但为了理解发明之理论或原理的在后文件

“X” 特别相关的文件, 单独考虑该文件, 认定要求保护的发明不是新颖的或不具有创造性

“Y” 特别相关的文件, 当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时, 要求保护的发明不具有创造性

“&” 同族专利的文件

国际检索实际完成的日期

19.9 月 2011 (19.09.2011)

国际检索报告邮寄日期

20.10 月 2011 (20.10.2011)

ISA/CN 的名称和邮寄地址:

中华人民共和国国家知识产权局
中国北京市海淀区蓟门桥西土城路 6 号 100088
传真号: (86-10)62019451

受权官员

苏爱华

电话号码: (86-10) **62085747**

PCT/ISA/210 表(第 2 页) (2009 年 7 月)

国际检索报告
关于同族专利的信息

国际申请号
PCT/CN2011/070165

检索报告中引用的 专利文件	公布日期	同族专利	公布日期
CN2886625Y	04.04.2007	无	
CN201138428Y	22.10.2008	无	
CN1955865A	02.05.2007	EP1780615A1	02.05.2007
		JP2007121303A	17.05.2007
		SG131863A1	28.05.2007
		US2007109918A1	17.05.2007
		KR20070045926A	02.05.2007
		TW200736863A	01.10.2007
		US7755977B2	13.07.2010
		EP1780616A	02.05.2007
CN201149642Y	12.11.2008	无	
JP2008089533A	17.04.2008	无	
KR200186165Y	15.06.2000	无	

PCT/ISA/210 表(同族专利附件) (2009 年 7 月)

主题的分类

G04B 45/00 (2006.01) i

G04G 17/00 (2006.01) i

Electronic Acknowledgement Receipt	
EFS ID:	29996519
Application Number:	15261917
International Application Number:	
Confirmation Number:	4481
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Elissa A. Asaro
Filer Authorized By:	
Attorney Docket Number:	P22914USC3
Receipt Date:	07-AUG-2017
Filing Date:	10-SEP-2016
Time Stamp:	07:52:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P22914USC3IDS.pdf	21507	no	2
			5117901d9b4c78192a4ef2c0d7c3729574c6d931		
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P22914USC3IDSFormPTOSB08a.pdf	35471 54c58fae372ec03394e4071a914110457132a761	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	CN1054843.pdf	797969 65001e5fc560b8102e77c0465d70cc8e27c5fad3	no	8
Warnings:					
Information:					
4	Foreign Reference	CN1792295.pdf	1064688 45f690617d0a24c7e965b2515d0f9d5d11c0292c	no	14
Warnings:					
Information:					
5	Foreign Reference	CN103253067.pdf	1373906 b7f510f690b07ad36bbcb919392adcafe9fc112b9	no	16
Warnings:					
Information:					
6	Foreign Reference	CN201081979.pdf	424692 bbc556bd172882d43379562c2c0941c7298dfa71	no	6
Warnings:					
Information:					
7	Foreign Reference	CN202008579.pdf	640359 41d816a91dd0f33f905cd63f71bea01087717a01	no	8
Warnings:					
Information:					
8	Foreign Reference	CN203630524.pdf	699435 5d0ec545d1e583cc69668d331701a87d97d944c0	no	11
Warnings:					
Information:					

9	Foreign Reference	JP2013079961.pdf	1818816	no	13
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Warnings:					
Information:					
10	Foreign Reference	WO2012094805.pdf	732985	no	13
			9bed807c3782a7b8145f19f879aeb5b78e8a8582		
Warnings:					
Information:					
Total Files Size (in bytes):				7609828	
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. New Applications Under 35 U.S.C. 111 If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor(s): Fletcher R. Rothkopf	
App. No.: 15/261,917	Con. No.: 4481
Filed: September 10, 2016	Art Unit: Not Yet Assigned
Title: WEARABLE ELECTRONIC DEVICE	Examiner: Not Yet Assigned

**INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§1.97(b)(3) and 1.98 and
STATEMENT OF RELATEDNESS
UNDER M.P.E.P. § 2001.06(b)**

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

The Examiner is requested to consider the references noted on the enclosed Form PTO/SB/08a during examination of the above-identified patent application. These references are submitted for the Examiner's consideration and are submitted pursuant to the duty of disclosure under 37 C.F.R. § 1.56. In submitting these references, no representation is made or implied that the references are or are not material to the examination of the application. The Examiner is encouraged to make his or her own determination of materiality. Pursuant to the requirements of 37 C.F.R. § 1.98(a)(2)(ii), only copies of the foreign references are provided. Copies of the U.S. patent and U.S. patent application publication references are not provided, unless required by the Office.

In satisfaction of the duty of disclosure under 37 C.F.R. § 1.56, and as required by M.P.E.P. § 2001.06(b), the Examiner is requested to consider the following applications commonly owned by the Assignee of the present application, which may include subject matter similar to that of the present application:

- (1) U.S. patent application no. 15/597,145, filed May 16, 2017, pending; and
- (2) U.S. patent application no. 15/637,949 filed June 29, 2017, pending.

This Information Disclosure Statement is being filed before the mailing date of a first Office action. Therefore, pursuant to 37 C.F.R. § 1.97(b)(3), no fees are due with respect to

this filing. However, should any such fees or petitions be required, please consider this a request therefor and authorization to charge Deposit Account No. 504621 as necessary.

If the Examiner has any questions, please contact the undersigned.

Dated: August 7, 2017

Respectfully submitted,

/Elissa A. Asaro/
Elissa A. Asaro, Registration No. 64,659
Agent for Assignee
USPTO Customer No. 62579

Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, Colorado 80202
Phone: (303) 223-1100
Fax: (303) 223-1111

PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>	APPLICATION NO.: 15/261,917	FILING DATE: September 10, 2016
	INVENTOR(S): Fletcher R. Rothkopf	ART UNIT: 3765
	EXAMINER NAME: Not Yet Assigned	ATTY. DOCKET NO.: P22914USC3

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No. ¹	PATENT NUMBER	ISSUE DATE	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		

U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No. ¹	PUBLICATION NUMBER	PUBLICATION DATE	Name of Inventor(s) of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		
	1.	2016/0327911	11/2016	Eim et al.	
	2.	2017/0045958	02/2017	Battlogg et al.	

FOREIGN PATENT DOCUMENTS

EXAMINER INITIALS	Cite No. ¹	DOCUMENT NUMBER	PUBLICATION DATE	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Country Code ³ – Number ⁴ – Kind Code ⁵ (if known)	MM-DD-YYYY			

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

EXAMINER INITIALS	Cite No. ¹	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T ⁶
EXAMINER			DATE CONSIDERED
EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			

* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

Electronic Acknowledgement Receipt	
EFS ID:	29267703
Application Number:	15261917
International Application Number:	
Confirmation Number:	4481
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Elissa A. Asaro
Filer Authorized By:	
Attorney Docket Number:	P22914USC3
Receipt Date:	22-MAY-2017
Filing Date:	10-SEP-2016
Time Stamp:	08:17:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P22914USC3IDS.pdf	19995	no	2
			f8b12280a17a32b3ce5eba1e7f672587d02c29ad		
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P22914USC3IDSFormPTOSB08a.pdf	32540 1e59d01285acac80b6df8181359e2bf344376349	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
Total Files Size (in bytes):			52535		
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor(s): Fletcher R. Rothkopf	
App. No.: 15/261,917	Con. No.: 4481
Filed: September 10, 2016	Art Unit: Not Yet Assigned
Title: WEARABLE ELECTRONIC DEVICE	Examiner: Not Yet Assigned

**INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§1.97(b)(3) and 1.98**

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

The Examiner is requested to consider the references noted on the enclosed Form PTO/SB/08a during examination of the above-identified patent application. These references are submitted for the Examiner's consideration and are submitted pursuant to the duty of disclosure under 37 C.F.R. § 1.56. In submitting these references, no representation is made or implied that the references are or are not material to the examination of the application. The Examiner is encouraged to make his or her own determination of materiality. Pursuant to the requirements of 37 C.F.R. § 1.98(a)(2)(ii), copies of the U.S. patent publication references are not provided, unless required by the Office.

This Information Disclosure Statement is being filed before the mailing date of a first Office action. Therefore, pursuant to 37 C.F.R. § 1.97(b)(3), no fees are due with respect to this filing. However, should any such fees or petitions be required, please consider this a request therefor and authorization to charge Deposit Account No. 504621 as necessary.

If the Examiner has any questions, please contact the undersigned.

Dated: May 22, 2017

Respectfully submitted,

/Elissa A. Asaro/

Elissa A. Asaro, Registration No. 64,659

Agent for Assignee

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PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>	APPLICATION NO.: 15/261,917	FILING DATE: September 10, 2016
	INVENTOR(S): Fletcher R. Rothkopf	ART UNIT: 3765
	EXAMINER NAME: Not Yet Assigned	ATTY. DOCKET NO.: P22914USC3

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No. ¹	PATENT NUMBER	ISSUE DATE	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		
	1.	8,188,989	05/2012	Levin et al.	
	2.	8,847,741	09/2014	Birnbaum et al.	

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EXAMINER INITIALS*	Cite No. ¹	PUBLICATION NUMBER	PUBLICATION DATE	Name of Inventor(s) of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		

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EXAMINER INITIALS	Cite No. ¹	DOCUMENT NUMBER	PUBLICATION DATE	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Country Code ³ – Number ⁴ – Kind Code ⁵ (if known)	MM-DD-YYYY			

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

EXAMINER INITIALS	Cite No. ¹	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T ⁶
EXAMINER			DATE CONSIDERED
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¹ Applicant's unique citation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

Electronic Acknowledgement Receipt	
EFS ID:	29267011
Application Number:	15261917
International Application Number:	
Confirmation Number:	4481
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Elissa A. Asaro
Filer Authorized By:	
Attorney Docket Number:	P22914USC3
Receipt Date:	21-MAY-2017
Filing Date:	10-SEP-2016
Time Stamp:	14:14:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

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File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P22914USC3IDS.pdf	19984	no	2
			344627b04e7a51687277e07362eaf91feed0a61f		
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P22914USC3IDSFormPTOSB08a.pdf	32607 3abb154c4cd4f7503f65aa3067adac15ec59e278	no	1
Warnings:					
Information:					
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Total Files Size (in bytes):			52591		
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In re Application of:

Inventor(s): Fletcher R. Rothkopf	
App. No.: 15/261,917	Con. No.: 4481
Filed: September 10, 2016	Art Unit: Not Yet Assigned
Title: WEARABLE ELECTRONIC DEVICE	Examiner: Not Yet Assigned

**INFORMATION DISCLOSURE STATEMENT
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If the Examiner has any questions, please contact the undersigned.

Dated: May 21, 2017

Respectfully submitted,

/Elissa A. Asaro/

Elissa A. Asaro, Registration No. 64,659

Agent for Assignee

USPTO Customer No. 62579

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Phone: (303) 223-1100

Fax: (303) 223-1111

PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>	APPLICATION NO.: 15/261,917	FILING DATE: September 10, 2016
	INVENTOR(S): Fletcher R. Rothkopf	ART UNIT: 3765
	EXAMINER NAME: Not Yet Assigned	ATTY. DOCKET NO.: P22914USC3

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No. ¹	PATENT NUMBER	ISSUE DATE	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		
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	2.	2,497,935	02/1950	Feurer	
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		Number – Kind Code ² (if known)	MM-DD-YYYY		
	39.	5,347,123	09/1994	Jackson et al.	
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EXAMINER INITIALS*	Cite No. ¹	PATENT NUMBER	ISSUE DATE	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		
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		Number – Kind Code ² (if known)	MM-DD-YYYY		
	164.	2003/0174590	09/2003	Arikawa et al.	
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		Number – Kind Code ² (if known)	MM-DD-YYYY		
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EXAMINER INITIALS*	Cite No. ¹	PUBLICATION NUMBER	PUBLICATION DATE	Name of Inventor(s) of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		
	213.	2016/0378069	12/2016	Rothkopf et al.	
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EXAMINER INITIALS*	Cite No. ¹	DOCUMENT NUMBER	PUBLICATION DATE	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	X ⁶
		Country Code ³ – Number ⁴ – Kind Code ⁵ (if known)	MM-DD-YYYY			
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	222.	CN1445627	10/2003	Seiko Epson Corp.		X
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¹ Applicant's unique citation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

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EXAMINER INITIALS ¹	Cite No. ¹	DOCUMENT NUMBER	PUBLICATION DATE	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	X ⁶
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	242.	JP2003331693	11/2003	Nidec Copal Corp.		X
	243.	JP2004184396	07/2004	Seiko Epson Corp.		X
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OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

EXAMINER INITIALS ¹	Cite No. ¹	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T ⁶
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EXAMINER		DATE CONSIDERED	
EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			

Electronic Acknowledgement Receipt	
EFS ID:	29050201
Application Number:	15261917
International Application Number:	
Confirmation Number:	4481
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Elissa A. Asaro
Filer Authorized By:	
Attorney Docket Number:	P22914USC3
Receipt Date:	27-APR-2017
Filing Date:	10-SEP-2016
Time Stamp:	15:17:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P22914USC3IDS.pdf	21748	no	2
			06dcf62d001bb51c2f858f4acc71740bd8acd19c		
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P22914USC3IDSFormPTOSB08a.pdf	90515 21d0b548cc5583d3d54cc27c7eae2abab20d585	no	8
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
Total Files Size (in bytes):			112263		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor(s): Fletcher R. Rothkopf	
App. No.: 15/261,917	Con. No.: 4481
Filed: September 10, 2016	Art Unit: Not Yet Assigned
Title: WEARABLE ELECTRONIC DEVICE	Examiner: Not Yet Assigned

**INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§1.97(b)(3) and 1.98 and
STATEMENT OF RELATEDNESS
UNDER M.P.E.P. § 2001.06(b)**

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

The Examiner is requested to consider the references noted on the enclosed Form PTO/SB/08a during examination of the above-identified patent application. These references are submitted for the Examiner's consideration and are submitted pursuant to the duty of disclosure under 37 C.F.R. § 1.56. In submitting these references, no representation is made or implied that the references are or are not material to the examination of the application. The Examiner is encouraged to make his or her own determination of materiality. Copies of all foreign and non-patent literature references cited on the attached Form PTO/SB/08a were previously provided to or cited by the Patent Office in parent application no. 14/842,617, filed September 1, 2015.

In satisfaction of the duty of disclosure under 37 C.F.R. § 1.56, and as required by M.P.E.P. § 2001.06(b), the Examiner is requested to consider the following applications commonly owned by the Assignee of the present application, which may include subject matter similar to that of the present application:

- (1) U.S. patent application no. 15/055,554, filed February 27, 2016, pending;
- (2) U.S. patent application no. 15/210,917, filed July 15, 2016, pending;
- (3) U.S. patent application no. 15/219,253 filed July 25, 2016, pending; and
- (4) U.S. patent application no. 15/465,523, filed March 21, 2017, pending.

This Information Disclosure Statement is being filed before the mailing date of a first Office action. Therefore, pursuant to 37 C.F.R. § 1.97(b)(3), no fees are due with respect to this filing. However, should any such fees or petitions be required, please consider this a request therefor and authorization to charge Deposit Account No. 504621 as necessary.

If the Examiner has any questions, please contact the undersigned.

Dated: April 27, 2017

Respectfully submitted,

/Elissa A. Asaro/

Elissa A. Asaro, Registration No. 64,659
Agent for Assignee
USPTO Customer No. 62579

Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
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Phone: (303) 223-1100
Fax: (303) 223-1111

PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>	APPLICATION NO.: 15/261,917	FILING DATE: September 10, 2016
	INVENTOR(S): Fletcher R. Rothkopf	ART UNIT: 3765
	EXAMINER NAME: Not Yet Assigned	ATTY. DOCKET NO.: P22914USC2

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EXAMINER INITIALS*	Cite No. ¹	PATENT NUMBER	ISSUE DATE	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		
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U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No. ¹	PUBLICATION NUMBER	PUBLICATION DATE	Name of Inventor(s) of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number – Kind Code ² (if known)	MM-DD-YYYY		
	2.	2011/0007468	01/2011	Burton et al.	
	3.	2012/0177237	07/2012	Shukla et al.	

FOREIGN PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No. ¹	DOCUMENT NUMBER	PUBLICATION DATE	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Country Code ³ – Number ⁴ – Kind Code ⁵ (if known)	MM-DD-YYYY			
	4.	CH1888928	01/1937	Kinkhorst et al.		X
	5.	CN103191557	07/2013	Nike International Ltd.		X
	6.	CN103645804	03/2014	Samsung Electronics R&D Center		X
	7.	CN203732900	07/2014	Qu		X
	8.	CN103956006	07/2014	Jinling Institute of Technology		X

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

EXAMINER INITIALS*	Cite No. ¹	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T ⁶
	9.	GreyB, "Google Watch: Convert your arm into a keyboard," http://www.whatafuture.com/2014/02/28/google-smartwatch/#sthash.Yk35cDXK.dpbs , 3 pages, February 28, 2014.	

* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

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OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
	10.	Invitation to Pay Additional Fees, PCT/US2015/047958, 8 pages, December 2, 2015.	
EXAMINER		DATE CONSIDERED	
EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			

Electronic Acknowledgement Receipt	
EFS ID:	28506916
Application Number:	15261917
International Application Number:	
Confirmation Number:	4481
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Elissa A. Asaro
Filer Authorized By:	
Attorney Docket Number:	P22914USC3
Receipt Date:	01-MAR-2017
Filing Date:	10-SEP-2016
Time Stamp:	17:40:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P22914USC3IDS.pdf	20105	no	2
			c81d4db472aa504d8e704e7ab04f46939de04a7d		
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P22914USC3IDSFormPTOSB08a.pdf	36904 f60c0610cf3c07c8b35508bc4b1c293ce928doc2	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
Total Files Size (in bytes):			57009		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor(s): Fletcher R. Rothkopf	
App. No.: 15/261,917	Con. No.: 4481
Filed: September 10, 2016	Art Unit: Not Yet Assigned
Title: WEARABLE ELECTRONIC DEVICE	Examiner: Not Yet Assigned

**INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§1.97(b)(3) and 1.98**

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

The Examiner is requested to consider the references noted on the enclosed Form PTO/SB/08a during examination of the above-identified patent application. These references are submitted for the Examiner's consideration and are submitted pursuant to the duty of disclosure under 37 C.F.R. § 1.56. In submitting these references, no representation is made or implied that the references are or are not material to the examination of the application. The Examiner is encouraged to make his or her own determination of materiality. Copies of all foreign and non-patent literature references cited on the attached Form PTO/SB/08a were previously provided to or cited by the Patent Office in parent application no. 14/842,617, filed September 1, 2015.

This Information Disclosure Statement is being filed before the mailing date of a first Office action. Therefore, pursuant to 37 C.F.R. § 1.97(b)(3), no fees are due with respect to this filing. However, should any such fees or petitions be required, please consider this a request therefor and authorization to charge Deposit Account No. 504621 as necessary.

If the Examiner has any questions, please contact the undersigned.

Dated: March 1, 2017

Respectfully submitted,

/Elissa A. Asaro/

Elissa A. Asaro, Registration No. 64,659

Agent for Assignee

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/261,917	09/10/2016	Fletcher R. Rothkopf	P22914USC3

CONFIRMATION NO. 4481

PUBLICATION NOTICE



62579
APPLE INC.
c/o Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, CO 80202

Title:WEARABLE ELECTRONIC DEVICE

Publication No.US-2016-0378071-A1

Publication Date:12/29/2016

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publicly available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <http://pair.uspto.gov/>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
15/261,917	09/10/2016	3765	1600	P22914USC3	20	3

CONFIRMATION NO. 4481

FILING RECEIPT



CC000000083948955

62579
APPLE INC. (Brownstein)
c/o Brownstein Hyatt Farber Schreck LLP
410 Seventeenth Street
Suite 2200
Denver, CO 80202

Date Mailed: 09/22/2016

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Fletcher R. Rothkopf, Cupertino, CA;

Applicant(s)

Apple Inc., Cupertino, CA;

Power of Attorney: The patent practitioners associated with Customer Number 62579

Domestic Priority data as claimed by applicant

This application is a CON of 14/842,617 09/01/2015
which claims benefit of 62/044,974 09/02/2014

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 09/21/2016

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/261,917**

Projected Publication Date: 12/29/2016

Non-Publication Request: No

Early Publication Request: No
Title

WEARABLE ELECTRONIC DEVICE

Preliminary Class

002

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/261,917	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(j))	20	minus 20 = *				x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *				x 420 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1600
APPLICATION AS AMENDED - PART II							
AMENDMENT A	(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY
	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	OR OTHER THAN SMALL ENTITY
	Total (37 CFR 1.16(i))	*	Minus	**	x	=	OR OTHER THAN SMALL ENTITY
	Independent (37 CFR 1.16(h))	*	Minus	***	x	=	OR OTHER THAN SMALL ENTITY
	Application Size Fee (37 CFR 1.16(s))						OR OTHER THAN SMALL ENTITY
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR OTHER THAN SMALL ENTITY
				TOTAL ADD'L FEE		TOTAL ADD'L FEE	
AMENDMENT B	(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY
	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	OR OTHER THAN SMALL ENTITY
	Total (37 CFR 1.16(i))	*	Minus	**	x	=	OR OTHER THAN SMALL ENTITY
	Independent (37 CFR 1.16(h))	*	Minus	***	x	=	OR OTHER THAN SMALL ENTITY
	Application Size Fee (37 CFR 1.16(s))						OR OTHER THAN SMALL ENTITY
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR OTHER THAN SMALL ENTITY
				TOTAL ADD'L FEE		TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.							

Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number

UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>	Attorney Docket No.	P22914USC3
	First Named Inventor	Fletcher R. Rothkopf
	Title	WEARABLE ELECTRONIC DEVICE
	Express Mail Label No.	n/a

APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents.</i>	ADDRESS TO: Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450
1. ☐ Fee Transmittal Form (PTO/SB/17 or equivalent)	ACCOMPANYING APPLICATION PAPERS 10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____ 11. ☐ 37 CFR 3.73(c) Statement (when there is an assignee) ☒ Power of Attorney 12. ☐ English Translation Document (if applicable) 13. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of citations attached 14. ☒ Preliminary Amendment 15. ☐ Return Receipt Postcard (MPEP § 503) (Should be specifically itemized) 16. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed) 17. ☐ Nonpublication Request Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 18. ☐ Other: _____ _____ _____ _____
2. ☐ Applicant asserts small entity status. See 37 CFR 1.27	
3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.	
4. ☒ Specification [Total Pages <u>97</u>] Both the claims and abstract must start on a new page. (See MPEP § 608.01(a) for information on the preferred arrangement)	
5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>26</u>]	
6. ☐ Inventor's Oath or Declaration [Total Pages <u>1</u>] (including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))	
a. ☐ Newly executed (original or copy) b. ☒ A copy from a prior application (37 CFR 1.63(d))	
7. ☒ Application Data Sheet * See note below. See 37 CFR 1.76 (PTO/AIA/14 or equivalent)	
8. ☐ CD-ROM or CD-R in duplicate, large table, or Computer Program (Appendix) ☐ Landscape Table on CD	
9. ☐ Nucleotide and/or Amino Acid Sequence Submission (if applicable, items a. -- c. are required)	
a. ☐ Computer Readable Form (CRF) b. ☐ Specification Sequence Listing on: i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies	

*Note: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 must be included in an Application Data Sheet (ADS).
 (2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS					
☒ The address associated with Customer Number: <u>62579</u> OR ☐ Correspondence address below					
Name					
Address					
City	State	Zip Code			
Country	Telephone	Email			
Signature	/Elissa A. Asaro/			Date	September 10, 2016
Name (Print/Type)	Elissa A. Asaro			Registration No. (Attorney/Agent)	64,659

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P22914USC3
		Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor 1					Remove		
Legal Name							
Prefix	Given Name		Middle Name		Family Name		Suffix
	Fletcher		R.		Rothkopf		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service							
City	Cupertino		State/Province	CA	Country of Residence	US	
Mailing Address of Inventor:							
Address 1		One Infinite Loop, MS: 305-1PH					
Address 2							
City	Cupertino			State/Province	CA		
Postal Code	95014			Country	US		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. Add							

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence Information of this application.			
Customer Number	62579		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	WEARABLE ELECTRONIC DEVICE		
Attorney Docket Number	P22914USC3	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	26	Suggested Figure for Publication (if any)	6
Filing By Reference:			

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P22914USC3
		Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE		

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	62579		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the application number blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	14842617	2015-09-01
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14842617	Claims benefit of provisional	62044974	2014-09-02

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P22914USC3
		Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE		

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Remove Access Code ⁱ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P22914USC3
		Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE		

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant 1			
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
Clear			
☒ Assignee	☐ Legal Representative under 35 U.S.C. 117	☐ Joint Inventor	
☐ Person to whom the inventor is obligated to assign.		☐ Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor :			
If the Applicant is an Organization check here. ☒			
Organization Name	Apple Inc.		
Mailing Address Information For Applicant:			
Address 1	One Infinite Loop		
Address 2			
City	Cupertino	State/Province	CA
Country	US	Postal Code	95014
Phone Number		Fax Number	

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P22914USC3
		Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE		
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.					
Signature	/Elissa A. Asaro/			Date (YYYY-MM-DD)	2016-09-10
First Name	Elissa A.	Last Name	Asaro	Registration Number	64659
Additional Signature may be generated within this form by selecting the Add button.					

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P22914USC3
		Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE		

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WEARABLE ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a nonprovisional patent application of and claims the benefit of U.S. Provisional Patent Application No. 62/044,974, filed September 2, 2014 and titled “Wearable Electronic Device and Associated Methods of Use and Manufacture,” the disclosure of which is hereby incorporated herein by reference in its entirety.

FIELD

[0002] The following disclosure generally relates to an electronic device, and more specifically to a wearable electronic device having a range of features, including touch input, force input, an interchangeable attachment system, health monitoring functionality, wireless power charging, wireless authentication and transaction functionality, and other features and functionality.

BACKGROUND

[0003] Portable electronic devices have become increasingly popular, and the features and functionality provided by portable electronic devices continue to expand to meet the needs and expectations of many consumers. However, some traditional portable electronic devices, particularly wearable electronic devices, may have relatively limited functionality or are only able to perform a specialized set of functions or tasks. For example, some traditional electronic wristwatches may be configured to perform a relatively limited set of functions, including displaying time, date, and performing basic timing functions. The embodiments described herein are directed to a wearable electronic device that provides a wide range of functionality, as compared to some traditional wearable electronic devices.

SUMMARY

[0004] The embodiments included herein are directed to a consumer product, which may include a portable or wearable electronic device that is configured to provide an expansive feature set integrated or incorporated into a compact form factor. In some aspects of the present disclosure, a consumer product may integrate or combine multiple subsystems into a single device to provide a wide range of functionality, including biometric sensing, touch-based user input, near-field communications, and other desirable features. In some aspects, multiple subsystems are integrated into the relatively compact space of a wrist-worn device.

[0005] Some example embodiments are directed to wearable electronic device having a housing that includes a flat bottom portion, a top portion defining a cavity, and a curved side portion that extends from the bottom portion to the top portion. A band may be attached to the housing and configured to secure the wearable electronic device to a user. A display may be at least partially disposed within the cavity and may have a viewable area. The device may also include a cover disposed above the display and including a flat middle portion larger than the viewable area of the display, a curved edge portion surrounding the flat middle portion and coinciding with the curved side portion along a perimeter of the cavity to form a continuous contoured surface.

[0006] In some embodiments, the continuous contoured surface is tangent with the flat bottom portion of the housing at a first end of the contour. The continuous contoured surface may also be tangent with the flat middle portion of the cover at a second end of the contour. In some embodiments, the continuous contoured surface has a constant radius.

[0007] In some embodiments, the cavity has a rectangular shape. The curved edge portion of the housing may have four sides that surround the cavity, each side is orthogonal to two adjacent sides. Each side may be connected to an adjacent side by a rounded corner. In some embodiments, the rounded corners have a curvature that corresponds to a curvature of the continuous contoured surface formed by the curved edge portion of the cover and the curved side portion of the housing.

[0008] Some embodiments include a crown module that is positioned at least partially within an aperture formed within the curved side portion of the housing. The crown module may include

an outer surface configured to receive a rotary user input. The crown module may be offset with respect to a centerline of the housing between the top portion and the flat bottom portion. The offset may be toward the top portion of the housing. The crown module may include a dial having a portion that is higher than an interface between the cover and the housing.

[0009] In some example embodiments, a port is formed in the curved side portion of the housing. An acoustic module may be disposed within the housing and configured to produce an audio output through the port. The acoustic module may include an acoustic element and an acoustic cavity that acoustically couples the acoustic element to the port. The port may include an orifice that is offset with respect to the acoustic cavity to prevent the direct ingress of liquid into the acoustic module.

[0010] In some embodiments, the device includes a gasket positioned between the housing and the cover. The housing may also include a ledge formed along a perimeter of the cavity. The gasket may be positioned along the ledge that is formed along the perimeter of the cavity. The gasket, the cover, and the housing may be configured to cooperate to form a substantially water-proof seal.

[0011] In some example embodiments, the device includes a biosensor module that is disposed in an opening formed in the flat bottom portion of the housing. The biosensor module may include a chassis positioned in the opening of the housing and defining an array of windows. An array of light sources may be attached to the chassis and configured to emit light into the user through the array of windows. The biosensor module may also include an optically transparent rear cover disposed over the chassis and over the array of windows and operative to pass light emitted from the array of light sources into the user. In some embodiments, the rear cover has a convex outer contour.

[0012] Some example embodiments are directed to an electronic device having a housing comprising a bottom portion defining an opening and a band attached to the housing and configured to secure the electronic device to a user. A biosensor module may be disposed within the opening of the housing. A rear cover may be disposed over the biosensor module and may include an edge protruding outwardly from the bottom portion of the housing and an outer surface having a convex curved contour. In some embodiments, the outer surface of the rear

cover defines one or more windows that provide operational access to one or more optical components of the biosensor module. The one or more windows may have a curvature that matches the convex curved contour of the outer surface.

[0013] In some embodiments, the biosensor module includes an array of light sources that are configured to emit light into a body of the user. The biosensor module may also include a photodetector configured to receive light produced by a light source of the array of light sources that is reflected from the body and produce a sensor signal. In some cases, the biosensor module is removably coupled to the housing.

[0014] In some embodiments, the device also includes a processing unit configured to compute a health metric associated with the user based on the sensor signal. The device may also include a display disposed within the housing and configured to display the health metric.

[0015] Some example embodiments are directed to a wearable electronic device, having a housing including a top portion, a cavity formed within the top portion, and a curved side portion that surrounds the cavity. The device may also include a transparent cover disposed over the cavity of the housing and may include a flat middle portion at a center of the transparent cover, a curved outer portion that emanates from and surrounds the flat middle portion and extends outwardly to an edge of the transparent cover, and a mask positioned relative to an internal surface of the transparent cover. The mask may have an outer boundary located proximate to the edge of the transparent cover and an inner boundary located within the curved outer portion of the transparent cover.

[0016] In some embodiments, the device includes a display disposed below the transparent cover. A perimeter portion of a viewable area of the display may be disposed below the mask. The device may also include an antenna having a shape that corresponds to a shape of the cavity formed within the housing. The antenna may be disposed in a groove formed in the internal surface of the transparent cover. The groove may be formed between the outer boundary and the inner boundary of the mask. In some embodiments, the cover is formed from a sapphire material. The antenna may be configured to facilitate wireless communication between the wearable electronic device and an external device.

[0017] Some example embodiments are directed to an electronic device having a housing including a first end, a second end opposite the first end, a first side extending between the first and second ends, and a second side opposite to the first side and extending between the first and second ends. The first end may define a first groove extending between the first and second sides and may be configured to receive a first lug portion of a first band. The second end may define a second groove extending between the first and second sides and may be configured to receive a second lug portion of a second band. The first and second grooves may have an inwardly curved concave shape with an undercut feature that retains the first and second lug portions. In some embodiments, the first groove extends through a solid portion of the housing to form a continuous interior shape.

[0018] In some embodiments, the device includes a display at least partially disposed within a cavity of the housing. A cover may be disposed above the display and at least a portion of the first groove is disposed below the cover. The first and second grooves may be formed at an angle with respect to a centerline of the housing. The first and second grooves may be angled upward toward a top of the housing and inward toward the center of the housing. The first and second grooves may cross the centerline of the housing.

[0019] Some example embodiments are directed to a wearable electronic device including a housing and a band attached to the housing and configured to secure the wearable electronic device to a user. A crown may be disposed relative to the housing and configured to receive a rotational input. An encoder may be operatively coupled to the crown and configured to produce an encoder output that corresponds to the rotational input. A speaker module may be disposed within the housing and configured to produce an audio output that corresponds to the encoder output. A haptic device may be disposed within the housing and configured to produce a haptic output that corresponds to the encoder output. In some embodiments, the haptic output is synchronized with the audio output. The crown may be further configured to translate along an axis and actuate a tactile switch.

[0020] In some embodiments, the device also includes a display element within the housing. The device may be configured to display a list of items on the display element and scroll the list of items in response to the encoder output. The device may also be configured to synchronize

the audio and haptic outputs with the scrolling of the list of items. In some embodiments, the crown is further configured to translate along an axis and actuate a tactile switch. The crown may be operative to select an item of the list of items when the tactile switch is actuated.

[0021] Some example embodiments are directed to a wearable electronic device having a housing that includes a bottom portion and an aperture formed in the bottom portion. A band may be attached to the housing and configured to secure the wearable electronic device to a user. A biosensor module may be disposed in the aperture of the housing. The biosensor module may include an array of light sources configured to emit light into a body of the user, and a photodetector configured to receive light produced by a light source of the array of light sources that is reflected from the body and produce a sensor signal. The device may also include a processing unit that is configured to compute a health metric associated with the user based on the sensor signal. A display may be disposed within the housing and configured to display the health metric.

[0022] In some embodiments, the array of light sources and the photodetector are configured to function as multiple photoplethysmography (PPG) sensors. Each PPG sensor may be configured to be used to compute a separate health metric. In some embodiments, a first light source of the array of light sources includes a green LED adapted to detect blood perfusion in the body. A second light source of the array of light sources may include an infrared LED adapted to detect water content of the body. The health metric may include one or more of: a heart rate, a respiration rate, a blood oxygenation level, and a blood volume estimate.

[0023] In some embodiments, the device also includes at least one pair of electrodes disposed on an exterior surface of the housing. The at least one pair of electrodes may be configured to produce a signal when the at least one pair of electrodes is in contact with the body. In some case, the signal is used to compute an additional health metric that includes one or more of: a heart function, a body fat estimate, and a body fat estimate.

[0024] Some example embodiments are directed to a wearable electronic device including a housing and a band attached to the housing and configured to secure the wearable electronic device to a user. The device may also include an array of light emitting diodes (LEDs) disposed within the housing, the array of LEDs being configured to emit light. A photodetector may be

disposed within the housing and configured to receive light produced by an LED of the array of LEDs that is reflected from a body of the user and produce a first sensor signal in response to the received light. The device may also include at least one pair of electrodes disposed on an exterior surface of the wearable electronic device. The electrodes may be configured to produce a second sensor signal when the electrodes are in contact with a respective portion of the body. The device may also include a processing unit that is configured to compute one or more health metrics based on the first and second sensor signals. The device may also include a display disposed at least partially within the housing and configured to display the one or more health metrics.

[0025] Some example embodiments are directed to a wearable electronic device including a housing and a band attached to the housing and configured to secure the wearable electronic device to a user. A cover may be disposed relative to the housing and a display may be attached to a lower surface of the cover. A force sensor may be positioned between the cover and the housing and attaching the cover to the housing. The force sensor may be configured to detect the force of a touch on the cover. The force sensor may also form a barrier to prevent ingress of liquid into the wearable electronic device. In some embodiments, an antenna may be disposed relative to the cover and external from the housing. The antenna may be configured to facilitate wireless communication with an external device.

[0026] In some example embodiments, a wearable electronic device may include a housing and a band attached to the housing and configured to secure the wearable electronic device to a user. A display element may be positioned within the housing and a rechargeable battery may be disposed within the housing and operatively coupled to the display element. The device may also include a receive coil within the housing configured to inductively couple with an external transmit coil. A power conditioning circuit may be configured to recharge the rechargeable battery using power received by the receive coil. The power conditioning circuit may be configured to provide power to the display element. The device may also include a first alignment magnet positioned within the receive coil and configured to align the device with respect to a second alignment magnet positioned within the external transmit coil.

[0027] Some example embodiments are directed to a wearable electronic device that includes a housing and a band attached to the housing and configured to secure the wearable electronic device to a user. A cover may be positioned relative to the housing and a display may be disposed within the housing and below the cover. A force sensor may be disposed within the housing and configured to detect a force of a touch on the cover. A touch sensor may be disposed between the display and the cover. The touch sensor may be configured to detect a location of the touch on the cover. In some embodiments, the force sensor is disposed along a perimeter of the display. The device may also include a processing unit and memory disposed within the housing. The processing unit may be configured to interpret a touch gesture on a surface of the cover using a force output from the force sensor and a touch output from the touch sensor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The disclosure will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements.

[0030] FIG. 1 depicts an example wearable electronic device having a device body and band.

[0031] FIG. 2 depicts an example schematic diagram of a wearable electronic device.

[0032] FIG. 3 depicts an example functional diagram for a wearable electronic device.

[0033] FIG. 4 depicts an example wearable electronic device as part of a system of devices.

[0034] FIG. 5 depicts a system of interchangeable components for a wearable device.

[0035] FIG. 6 depicts an example wearable electronic device having a device body and band.

[0036] FIG. 7 depicts an exploded view of components of an example wearable electronic device.

[0037] FIG. 8 depicts an example housing for a wearable electronic device.

[0038] FIG. 9 depicts an example force sensor configured to use a capacitive measurement.

[0039] FIGs. 10A-B depict plan views of example force sensors.

[0040] FIG. 11 depicts an example force sensor configured to use a resistive measurement.

[0041] FIG. 12 depicts an example pixelated force sensor configured to use a resistive measurement.

[0042] FIGs. 13A-B depict example force sensor structures.

[0043] FIGs. 14A-C depict an example touch sensor based on mutual capacitance.

[0044] FIGs. 15A-B depict an example touch sensor based on self capacitance.

[0045] FIG. 16 depicts an example device having biosensors.

[0046] FIG. 17 depicts an example device having wireless communications with an external device.

[0047] FIG. 18 depicts an example electronic device and example dock of an inductive charging system.

[0048] FIG. 19 depicts a block diagram of an example inductive charging system.

[0049] FIG. 20 depicts an example acoustic module.

[0050] FIGs. 21A-B depict an example cover and antenna.

[0051] FIGs. 22A-B depict an example haptic module.

[0052] FIG. 23 depicts an example device having a crown module with an encoder.

[0053] FIGs. 24A-B depict an example device having a crown module with a tactile switch.

[0054] FIGs. 25A-C depict an example receiving feature for a band.

[0055] FIG. 26 depicts example elements of a display.

DETAILED DESCRIPTION

[0056] Provided herein are descriptions and examples of a consumer product, which may include a portable electronic device, a wearable electronic device, or other type of device. By way of example and not by way of limitation, the consumer product may be an electronic device, a mechanical device, or an electromechanical device. Specific example devices include mobile phones, personal digital assistants, music players, timekeeping devices, health monitoring devices, tablet computers, laptop computers, glasses (electronic or otherwise), portable storage devices, and the like.

[0057] In one particular embodiment, the consumer product is a portable and, more specifically, a wearable consumer product. A wearable consumer product is one that can be worn by or otherwise secured to a user. For example, the consumer product may be a wearable electronic device including, but not limited to, a wearable computer, a wearable watch, a wearable communication device, a wearable media player, a wearable health monitoring device, and the like. A wearable consumer product may be worn by a user in a variety of ways. In some examples, the consumer product is a wrist-worn product and may include a band that can be wrapped around a user's wrist to secure the consumer product to the user's body. The device may include one or more other types of attachments including, for example, an armband, lanyard, waistband, chest strap, and the like.

[0058] Some aspects of the disclosure are directed to a wearable electronic device having improved functionality and/or versatility as compared to some traditional wearable devices. For example, some aspects of the disclosure are directed to a consumer product, such as a portable electronic device, having an expansive feature set integrated or incorporated into a compact form factor. In some aspects of the present disclosure, a consumer product may integrate or combine multiple subsystems into a single device to provide a wide range of functionality, including biometric sensing, touch-based user input, near-field communications, and other desirable features. In some aspects, multiple subsystems are integrated into the relatively compact space of a wrist-worn device. Some aspects of the following disclosure are directed to the integration of a variety of subsystems or modules to provide functionality that may not be possible using some traditional device platforms. In some cases, the configuration and/or functionality

provided by the various subsystems may be configurable by the end user, the manufacturer, and/or a vendor of the device. Example subsystems or modules of a consumer product and their respective functions are described below with respect to FIGs. 2 and 3.

[0059] Some aspects of the disclosure are directed to a consumer product that is configured to communicate wirelessly with any of a number of other devices, such as a mobile phone, computer, tablet computing devices, personal media players, televisions, networked home appliances, networked home controls, electronic systems in vehicles, and so on. Through wireless communication with other devices, the consumer product may transmit and/or receive various notifications, messages, or other information between devices. The wireless communication may also facilitate the relay of alerts or other device outputs to notify the user of an event or action. In some aspects, the consumer product may communicate wirelessly with any of a number of electronic accessories, including headset devices, portable speaker devices, portable microphone devices, display screens, and so on. An example communication system is described below with respect to FIG. 4 and with respect to other examples provided herein.

[0060] In some aspects, the consumer product may include a system of interchangeable components used to attach or secure the consumer product to the user. The system of interchangeable components may include a set of interchangeable bands or attachment devices that are configured to connect or attach to a receiving feature on the body of the product. The receiving feature may be standardized within the system of interchangeable components and allow multiple types of bands or attachment devices to be used with the same housing or body. The system of interchangeable components may also allow for an interchange between different bodies, which may include different types of electronic devices or other consumer products. Each body of the different devices or products may have a similar receiving feature that is standardized within the system of interchangeable components. An example system of interchangeable components is described below with respect to FIG. 5 and with respect to other examples provided herein.

[0061] Some aspects of the present disclosure are directed to a consumer product that includes a body that includes a case or housing used to protect as well as support the internal components of the product in their assembled position. The housing may enclose and support various

components, including, for example, integrated circuits, subsystems, modules, and other internal components of the device. In some aspects, the housing forms a water-resistant or water-proof barrier and also provides structural rigidity necessary to protect internal components. The housing may be formed as a single piece, which may enhance the structural rigidity, water impermeability, and manufacturability of the housing. An example housing and example internal components for a consumer product are provided below with respect to FIGs. 6-8 and with respect to other examples provided herein.

[0062] In some aspects, the consumer product includes a force sensor that is configured to detect and measure the magnitude of a force or pressure on a surface of the product. In some implementations, the force sensor includes a capacitive-based sensor that is configured to estimate the force based on a deflection or movement between capacitive plates that is caused by and correlates to the amount of force caused by a touch. In some implementations, the force sensor is a resistance- or charge-based sensor that is configured to estimate the force based on the deflection of a sheet or film that is positioned relative to the touch-sensitive surface of the product. In some implementations, the output from the force sensor is combined with the output from a touch sensor, which may be self-capacitive or mutually capacitive, or a combination of the two. Example force and touch sensors are described below with respect to FIGs. 9-15B and with respect to other examples provided herein.

[0063] In some aspects, the consumer product includes one or more biosensors. The biosensors may include optical and/or electronic biometric sensors that may be used to compute one or more health metrics. Example health metrics include, without limitation, a heart rate, a respiration rate, blood oxygenation level, a blood volume estimate, blood pressure, or a combination thereof. In some embodiments, the biosensors include an electrical sensor that may be used to measure electrocardiographic (ECG) characteristics, galvanic skin resistance, and other electrical properties of the user's body. An example consumer product having multiple biosensors is described below with respect to FIG. 16 and with respect to other examples herein.

[0064] In some aspects, the consumer product is configured to perform wireless communication with an external device. In some implementations, the wireless communication may include a Near Field Communication (NFC) interface. The NFC interface may be used to identify the

device and initiate a secure data connection, which may be used to authorize transactions, purchases, or conduct other forms of e-commerce. An example consumer product having wireless communications with an external device is described in more detail below with respect to FIG. 17 and with respect to other examples herein.

[0065] In some aspects, the consumer product is configured to recharge an internal battery using a wireless charging system. In some implementations, the consumer product includes one or more receiving inductive coils that are configured to cooperate with one or more transmitting inductive coils that are located in a charging dock or other external device. The wireless charging system may allow the transfer of power and/or wireless communications with the consumer product without the use of an external port or terminal connection. An example consumer product having wireless charging capabilities is described in more detail below with respect to FIGs. 18-19 and with respect to other examples herein.

[0066] In some aspects, the consumer product includes one or more acoustic modules that are configured to function as a speaker and/or a microphone for the product. The speaker and/or microphone may include features that enhance the water/liquid resistance or impermeability of the consumer product. The consumer product may also include a haptic module or actuator that is configured to produce a haptic output that may be perceived by the user. In some implementations, the output of an acoustic module, such as a speaker, and the haptic module may be used to provide feedback or an alert to the user. In some cases, an acoustic module and the haptic module provide feedback to the user and may be coordinated with a user input, such as user-interface selecting, user-interface scrolling, or other user input command. An example acoustic module is described below with respect to FIG. 20 and an example haptic module is described below with respect to FIGs. 22A-B.

[0067] In some aspects, the consumer product includes a dial or crown that is coupled to an encoder or other rotary sensor for detecting a rotary input. In some implementations, the output from the optical encoder is used to drive an aspect of a user interface or control other functionality of the product. Additionally, the dial or crown may include a tactile switch that can be actuated by pressing inward on the dial or crown. An example consumer product having a

crown is described below with respect to FIGs. 23-24B and with respect to other examples herein.

[0068] The description that follows includes sample devices, components, modules, systems, methods, and apparatuses that embody various elements of the present disclosure. However, it should be understood that various elements of the described disclosure may be combined and/or practiced in a variety of forms in addition to those described herein. In particular, the modules and components are described in a particular combination with respect to some examples provided below. However other combinations are possible, which may be achieved by adding, removing, and/or re-arranging modules to obtain a device or system having the desired characteristics.

[0069] FIG. 1 depicts a wearable consumer product 10. For example, the consumer product 10 may be a wearable electronic device. In one example, the consumer product 10 may be a wearable multifunctional electronic device including multiple functionalities such as time keeping, health monitoring, sports monitoring, medical monitoring, communications, navigation, computing operations, and/or the like. The functionalities may include but are not limited to: keeping time; monitoring a user's physiological signals and providing health-related information based on those signals; communicating (in a wired or wireless fashion) with other electronic devices or services, which may be different types of devices having different functionalities; providing alerts to a user, which may include audio, haptic, visual and/or other sensory output, any or all of which may be synchronized with one another; visually depicting data on a display; gathering data from one or more sensors that may be used to initiate, control, or modify operations of the device; determining a location of a touch on a surface of the device and/or an amount of force exerted on the device, and using either or both as input; accepting voice input to control one or more functions; accepting tactile input to control one or more functions; capturing and transmitting images; and so on. These and other functions and features will be described in more detail herein.

[0070] The wearable consumer product 10 can take a variety of forms. In one example, the consumer product 10 may be a wrist-worn electronic device. The device may include a variety of types of form factors including, wristbands, armbands, bracelets, jewelry, and/or the like.

[0071] In the illustrated embodiment, the consumer product 10 includes a device body 11. The device body 11 may include a housing that carries, encloses and supports both externally and internally various components (including, for example, integrated circuit chips and other circuitry) to provide computing and functional operations for the consumer product 10. The components may be disposed on the outside of the housing, partially within the housing, through the housing, completely inside the housing, and the like. The housing may, for example, include a cavity for retaining components internally, holes or windows for providing access to internal components, and various features for attaching other components. The housing may also be configured to form a water-resistant or water-proof enclosure for the body 11. For example, the housing may be formed from as a single unitary body and the openings in the unitary body may be configured to cooperate with other components to form a water-resistant or water-proof barrier.

[0072] Examples of components that may be contained in the device body 11 include processing units, memory, display, sensors, biosensors, speakers, microphones, haptic actuators, batteries, and so on. In some cases, the device body 11 may take on a small form factor. In cases such as these, the components may be packaged and/or in order to provide the most functionality in the smallest space. The components may also be configured to take up a minimal amount of space, which may facilitate the device body 11 having a small form factor. Additionally, the integration and assembly of the various components may be configured to enhance the reliability of the consumer product 10.

[0073] The construction of the housing of the device body 11 may be widely varied. For example, housing may be formed from a variety of materials including plastic, rubber, wood, silicone, glass, ceramics, fiber composites, metal or metal alloys, (e.g., stainless steel, aluminum), precious metals (e.g., gold, silver), or other suitable materials, or a combination of these materials.

[0074] Also in the illustrated embodiment, the wearable electronic device includes a band 12 or strap or other means for attaching to a user. The band 12 may, for example, be configured to attach to the body and provide a loop for securing to the wrist of the user. The band 12 may be integral with the housing or it may be a separate part. If integral, the band 12 may be a

continuation of the housing. In some cases, the integral band may be formed from the same material as the housing. If the band 12 is separate, the band may be fixed or releasably coupled to the housing. In both cases, the band 12 may be formed from similar or different materials as the housing. In most cases, the band 12 is formed from a flexible material such that it can conform to a user's body. Furthermore, the band 12 itself may be a single integral part or it may include attachment ends that provide an open and closed configuration. The attachment ends may, for example, be manifested as a clasp or other similar attachment mechanism or device. This particular configuration allows a user to open the band 12 for placement on the arm and close the band 12 in order to secure the band and body to the arm. The band 12 may be widely varied. By way of example, they may be formed from rubber, silicone, leather, metal, mesh, links and/or the like.

[0075] FIG. 2 depicts an example schematic diagram of a wearable electronic device. By way of example, device 100 of FIG. 2 may correspond to the consumer product 10 shown in FIG. 1. To the extent that multiple functionalities, operations, and structures are disclosed as being part of, incorporated into, or performed by device 100, it should be understood that various embodiments may omit any or all such described functionalities, operations, and structures. Thus, different embodiments of the device 100 may have some, none, or all of the various capabilities, apparatuses, physical features, modes, and operating parameters discussed herein.

[0076] As shown in FIG. 2, the device 100 includes one or more processing units 102 that are configured to access a memory 104 having instructions stored thereon. The instructions or computer programs may be configured to perform one or more of the operations or functions described with respect to the device 100. For example, the instructions may be configured to control or coordinate the operation of a display 120, one or more input/output components 106, one or more communication channels 108, one or more sensors 110, a speaker 122, a microphone 124 and/or one or more haptic feedback devices 112.

[0077] The processing units 102 of FIG. 2 may be implemented as any electronic device capable of processing, receiving, or transmitting data or instructions. For example, the processing units 102 may include one or more of: a microprocessor, a central processing unit (CPU), an application-specific integrated circuit (ASIC), a digital signal processor (DSP), or combinations

of such devices. As described herein, the term “processor” is meant to encompass a single processor or processing unit, multiple processors, multiple processing units, or other suitably configured computing element or elements.

[0078] The memory 104 can store electronic data that can be used by the device 100. For example, a memory can store electrical data or content such as, for example, audio and video files, documents and applications, device settings and user preferences, timing and control signals or data for the various modules, data structures or databases, and so on. The memory 104 can be configured as any type of memory. By way of example only, the memory can be implemented as random access memory, read-only memory, Flash memory, removable memory, or other types of storage elements, or combinations of such devices.

[0079] In the schematic diagram of FIG. 2, the one or more input components 106 are represented as a single item within the schematic diagram. However, input components 106 may represent a number of different input components, including buttons, switches, and dials for accepting user input, and so on. More specifically, the input components 106 may correspond to the buttons, dials, crowns or other devices for receiving input. Generally, the input components 106 are configured to translate a user-provided input into a signal or instructions that may be accessed using instructions executed on the processing units 102. In the present example, the input components 106 may include the hardware configured to receive the user input (e.g., button, switch, crown, and encoder) which is operatively coupled to circuitry and firmware used to generate signals or data that are able to be accessed using processor instructions. Each input component 106 may include specialized circuitry for generating signals or data and, additionally or alternatively, circuitry and firmware for generating signals or data may be shared between multiple input components 106. In some cases, the input components 106 produce user-provided feedback for application-specific input that corresponds to a prompt or user interface object presented on display 120. For example, the crown (item 642 of FIG. 6) may be used to receive rotational input from the user, which may be translated into an instruction to scroll a list or object presented on the display 120. The input components 106 may also produce user input for system-level operations. For example the input components 106 may be configured to interact directly with hardware or firmware being executed on the device 100 for system-level

operations, including, without limitation, power on, power off, sleep, awake, and do-not-disturb operations.

[0080] As shown in FIG. 2, the device 100 may also include one or more acoustic elements, including a speaker 122 and a microphone 124. The speaker 122 may include drive electronics or circuitry and may be configured to produce an audible sound or acoustic signal in response to a command or input. Similarly, the microphone 124 may also include drive electronics or circuitry and is configured to receive an audible sound or acoustic signal in response to a command or input. The speaker 122 and the microphone 124 may be acoustically coupled to respective ports or openings in the housing that allow acoustic energy to pass, but may prevent the ingress of liquid and other debris. As shown in FIG. 2, the speaker 122 and microphone 124 are also operatively coupled to the processing units 102, which may control the operation of the speaker 122 and microphone 124. In some cases, the processing units 102 are configured to operate the speaker 122 to produce an acoustic output that corresponds to an application or system-level operation being performed on the device 100. In some cases, the speaker 122 is operatively coupled to other modules, including, for example, input components 106, such as a crown or button. In some implementations, the device 100 is configured to produce an audible output that corresponds to the operation of the crown or buttons using the speaker 122. The microphone 124 may be configured to produce an output or signal in response to an acoustic stimulus. For example, the microphone 124 may be operatively coupled to the memory 104 and may be configured to record audio input, including human speech, music, or other sounds. In some cases, the microphone 124 may be configured to receive voice signals, which may be interpreted as voice commands by the processing units 102.

[0081] The one or more communication channels 108 may include one or more wireless interface(s) that are adapted to provide communication between the processing unit(s) 102 and an external device. In general, the one or more communication channels 108 may be configured to transmit and receive data and/or signals that may be interpreted by instructions executed on the processing units 102. In some cases, the external device is part of an external communication network that is configured to exchange data with wireless devices. Generally, the wireless interface may include, without limitation, radio frequency, optical, acoustic, and/or magnetic signals and may be configured to operate over a wireless interface or protocol. Example wireless

interfaces include radio frequency cellular interfaces, fiber optic interfaces, acoustic interfaces, Bluetooth interfaces, infrared interfaces, USB interfaces, Wi-Fi interfaces, TCP/IP interfaces, network communications interfaces, or any conventional communication interfaces.

[0082] In some implementations, the one or more communications channels 108 may include a dedicated wireless communication channel between the device 100 and another user device, such as a mobile phone, tablet, computer, or the like. In some cases, output, including audio sounds or visual display elements, are transmitted directly to the other user device for output to the user. For example, an audible alert or visual warning may be transmitted to a user's mobile phone for output on that device. Similarly, the one or more communications channels 108 may be configured to receive user input provided on another user device. In one example, the user may control one or more operations on the device 100 using a user interface on an external mobile phone, table, computer, or the like.

[0083] Additionally, as described in more detail below with respect to FIG. 17, the communications channels 108 may include a Near Field Communication (NFC) interface. The NFC interface may be used to identify the device and initiate a secure data connection, which may be used to authorize transactions, purchases, or conduct other forms of e-commerce.

[0084] As shown in FIG. 2, the device 100 also includes one or more sensors 110 represented as a single item within the schematic diagram. However, the sensors 110 may represent a number of different sensors, including devices and components that are configured to detect environmental conditions and/or other aspects of the operating environment. Example sensors 110 include an ambient light sensor (ALS), proximity sensor, temperature sensor, barometric pressure sensor, moisture sensor, and the like. Thus, the sensors 110 may also be used to compute an ambient temperature, air pressure, and/or water ingress into the device. In some embodiments, the sensors 110 may include one or more motion sensors for detecting movement and acceleration of the device 100. The one or more motion sensors may include one or more of the following: an accelerometer, a gyroscope, a tilt sensor, or other type of inertial measurement device.

[0085] The device 100 also includes one or more biosensors 118 and may include optical and/or electronic biometric sensors that may be used to compute one or more health metrics. As

described in more detail below with respect to FIG. 16, one or more of the biosensors 118 may include a light source and a photodetector to form a photoplethysmography (PPG) sensor. The optical (e.g., PPG) sensor or sensors may be used to compute various health metrics including, without limitation, a heart rate, a respiration rate, blood oxygenation level, a blood volume estimate, blood pressure, or a combination thereof. One or more of the biosensors 118 may also be configured to perform an electrical measurement using one or more electrodes. The electrical sensor(s) may be used to measure electrocardiographic (ECG) characteristics, galvanic skin resistance, and other electrical properties of the user's body. Additionally or alternatively, one or more of the biosensors 118 may be configured to measure body temperature, exposure to UV radiation, and other health-related information.

[0086] The device 100 may also include one or more haptic devices 112. The haptic device 112 may include one or more of a variety of haptic technologies such as, but not necessarily limited to, rotational haptic devices, linear actuators, piezoelectric devices, vibration elements, and so on. In general, the haptic device 112 may be configured to provide punctuated and distinct feedback to a user of the device. More particularly, the haptic device 112 may be adapted to produce a knock or tap sensation and/or a vibration sensation. As shown in FIG. 2, the haptic device 112 may be operatively coupled to the processing unit 102 and memory 104. In some embodiments, the haptic device 112 may be directly controlled by the processing unit 102. In some embodiments, the haptic device 112 may be controlled, at least in part, by the operation of an input component 106, including, for example, a button, dial, crown, or the like. The operation of the haptic device 112 may also be paired or linked to the operation of one or more other output devices, including, for example, the display 120 or the speaker 122.

[0087] As shown in FIG. 2, the device 100 may include a battery 114 that is used to store and provide power to the other components of the device 100. The battery 114 may be a rechargeable power supply that is configured to provide power to the device 100 while it is being worn by the user. The device 100 may also be configured to recharge the battery 114 using a wireless charging system. Accordingly, in some cases, the device may include a wireless power module 116 that may be configured to receive power from an external device or dock. The wireless power module 116 may be configured to deliver power to components of the device, including the battery 114. The wireless power module 116 and an external charging station or

dock may also be configured to transmit data between the device and a base or host device. In some cases, the wireless power module 116 may interface with the wireless charging station or dock to provide an authentication routine that is able to identify specific hardware, firmware, or software on the device in order to facilitate device maintenance or product updates. A more detailed description of an example wireless charging station is provided below with respect to FIGs. 18-19.

[0088] The device 100 may include a variety of other components, including for example, a camera or camera modules. The camera may be configured to capture an image of a scene or subject located within a field of view of the camera. The image may be stored in a digital file in accordance with any one of a number of digital formats. In some embodiments, the device 100 includes a camera, which includes an image sensor formed from a charge-coupled device (CCD) and/or a complementary metal-oxide-semiconductor (CMOS) device. The camera may also include one or more optical components disposed relative to the image sensor, including, for example, a lens, an filter, a shutter, and so on.

[0089] FIG. 3 depicts functional elements of the device 100, in accordance with some embodiments. In particular, FIG. 3 depicts the inputs that may be received and outputs that may be produced on an example device 100. By way of example, the device 100 may correspond to the devices shown in FIGs. 1 and 2. As shown in FIG. 3, the device 100 may include a force input 302 that may be produced using a force sensor that is configured to detect and measure the magnitude of a force of a touch on a surface of the device. The force input 302 may include a non-binary output that is generated in response to a touch. For example, the force input 302 may include a range of values or analog value that corresponds to the amount of force exerted on a surface of the device. Additionally or alternatively, the force input 302 may include binary (e.g., on, off) output in response to the force of a touch. The force input 302 may be used to control various aspects of the device. For example, the force input 302 may be used to control an aspect, such as a cursor or item selection on a user interface presented on the display of the device. The force input 302 may also be used to control the audio output 308, haptic output 312, and other functionality of the device. The force input 302 may also be used to distinguish between different types of input from the user. For example, a light touch from the user may be interpreted as a scroll command and used to index or scroll through a list of items on the display.

A harder touch from the user may be interpreted as a selection or confirmation of an item on the display. In some embodiments, the force input 302 is used to distinguish an intentional touch from the user from an incidental or accidental touch that may be ignored.

[0090] As shown in FIG. 3, the device 100 may also include a touch input 306 that may be produced using a touch sensor that is configured to detect and measure the location of a touch on a surface of the device. In some implementations, the touch sensor is a capacitive-based touch sensor that is disposed relative to the display or display stack of the device. The touch sensor may be a separate non-integrated sensor relative to the force sensor. In alternative embodiments, the touch sensor may also be physically and/or logically integrated with the force sensor to produce a combined output. The touch input 306 may be used to control various aspects of the device. For example, the touch input 306 may be used to control an aspect of the user interface presented on the display of the device. The touch input 306 may also be used to control the audio output 308, haptic output 312, and other functionality of the device.

[0091] In some cases, the logical integration of the force input 302 and the touch input 306 enhances the versatility or adaptability of device 100 by enabling a more sophisticated user interface than is currently available on some traditional wearable devices. In particular, the force input 302 and the touch input 306 may be combined to interpret a wider range of gestures and input commands than may be possible using, for example, only a touch input. For example, the force input 302 may provide a magnitude of a force of a touch, which may be used to distinguish between two touch input commands that have a similar location or gesture path. An improved touch interface using both force input 302 and touch input 306 may be particularly advantageous when interpreting touch commands on a relatively small area surface, such as a display screen or cover glass of a wearable electronic device.

[0092] As shown in FIG. 3, the device 100 may also include a button/dial input 310 that may be produced using an input device that is configured to receive input from the user. As described previously, the device 100 may include one or more buttons disposed on or near an external surface of the housing and are configured to receive input from a user. The device may also include a dial or crown that is configured to accept rotational input from the user. As described

in more detail below with respect to FIGs. 24A-B, the dial or crown may also include a push feature that is adapted to accept input from the user.

[0093] The device 100 may also accept audio input 314 using a microphone or other acoustic sensing device. The audio input 314 may be adapted to accept input from the user, including voice commands and other audio signal input. The audio input 314 may also be adapted to detect and measure ambient audio conditions that may be used to adjust the volume of the audio output 308 or operation of the haptic output 312. The audio input 314 may also be used to record an audio stream or voice message in accordance with an audio recording application or software program.

[0094] As shown in FIG. 3, the device 100 may include a display output 304 in accordance with some embodiments. The display output 304 includes visual or graphical output that may be produced using the display element of the device. In some embodiments, the display output 304 includes a graphical user interface produced using an operating system or software application executed on one or more processing units of the device. In one example, the display output 304 includes a graphical depiction that resembles a watch face or other timekeeping device. In other examples, the display output 304 includes a graphical interface for an e-mail, text messaging, or other communication-oriented program. The display output 304 may also present visual information that corresponds to one of the other functional aspects of the device 100. For example, the display output 304 may include information that corresponds to the biosensor input 320, sensor input 318, force input 302, touch input 306, and others.

[0095] As shown in FIG. 3 the device 100 may include an audio output 308 that may be produced with a speaker or acoustic module. The audio output 308 may include sounds or audio signals that are associated with the operation of the device. For example, the audio output 308 may correspond to the operation of an input device to provide audio feedback to the user. For example the audio output 308 may correspond to an input received in the form of a force input 302, touch input 306, and/or button/dial input 310. In some cases, the audio output 308 may also include a portion of an auditory alert that may be produced alone or combined with a haptic output 312 and/or display output 304 of the device 100.

[0096] The device 100 may also include a sensor input 318 produced using one or more sensors that may be configured to monitor and detect various environmental conditions. For example, the sensor input 318 may include signals or data produced using an ambient light sensor, proximity sensor, temperature sensor, barometric pressure sensor, or other sensor for monitoring environmental conditions surrounding or near the device. In general, the sensor input 318 may be used to adapt the functionality of the device 100 to conform to the one or more environmental conditions. For example, the brightness of the display output 304, the volume of the audio output 308, and/or the operation of the input to the device 100 may be based on the sensor input 318.

[0097] In some embodiments, the sensor input 318 includes input produced by one or more motion sensors. The motion sensors may include one or more of the following: an accelerometer, a gyroscope, a tilt sensor, or other type of inertial measurement device. A sensor input 318 produced using one or more motion sensors may be used to monitor and detect changes in motion of the device 100. Changes in linear and angular motion may be used to determine or estimate an orientation of the device relative to a known location or fixed datum. The sensor input 318 produced from the one or more motion sensors may also be used to track the movement of the user. The movement of the user may be used to facilitate navigation or map-guided functionality of the device. Additionally, input related to the gross movement of the user can be used as a pedometer or activity meter, which may be stored and tracked over time to determine health metrics or other health-related information. Additionally, in some embodiments, sensor input 318 from the one or more motion sensors may be used to identify motion gestures. For example, the motion sensors can be used to detect an arm raise or the position of a user's body (within a predetermined confidence level of certainty).

[0098] The device 100 may also include a biosensor input 320 produced using one or more biosensors or biosensor modules that are configured to monitor physiological and/or health conditions of a user. As discussed above with respect to FIG. 2, the device may include one or more optical sensors for measuring heart rate, blood pressure, oxygen saturation, or a combination thereof. The device may also include one or more sensors having electrical contacts that are disposed to contact the user's body. The sensors may be configured to measure electrocardiographic (ECG) characteristics, galvanic skin resistance, and other electrical

properties of the user's body. Additionally or alternatively, sensors may be configured to measure body temperature, exposure to UV radiation, and other health related information. The biosensor input 320 may be combined with other aspects of the device to provide health-monitoring functionality. For example, the biosensor input 320 may be used to compute data that is presented using the display output 304. The operation of the biosensor input 320 may also be controlled using the force input 302, touch input 306, or other user input 310 to provide an interactive health monitoring function or application.

[0099] As shown in FIG. 3, the device may include a haptic output 312 that may be produced using one or more haptic devices that are configured to provide haptic feedback to the user. In particular, the haptic output 312 may be produced using one or more electromechanical subassemblies that are configured to induce motion or vibration in the device, which may be perceived or sensed by the user. In some cases, the haptic actuator or device is tuned to operate based on a resonance or near resonance with respect to the device, which may enhance haptic output. In some cases, the haptic actuator or device is configured to operate based on a resonance or near resonance with respect to some components of the device, such as the band or clasp of the device.

[0100] In some embodiments, the haptic output 312 may correspond to the operation of one or more other modules or subsystems. For example, the haptic output 312 may include a vibration or haptic feedback that corresponds to an audio alert or visual alert or signal produced by the acoustic module or display, respectively. Additionally or alternatively, the haptic output 312 may be operated in conjunction with an input from the user. The haptic output 312 may include haptic or force feedback that confirms that the user input was or is being received. By way of example, a haptic output 312 may include a click or vibration when the crown of the device is turned or a button is depressed. The haptic output 312 may also be coordinated with other functionality of the device including, for example, message transmission operations, power management operations, force sensor operations, biosensor operations, to provide a notification, to provide an alert, and others.

[0101] As shown in FIG. 3, the device 100 may also include communications input/output (I/O) 316, which may facilitate communication with an external device or system. The

communications I/O 316 may be produced using one or more wireless interfaces, including radio frequency cellular interfaces, fiber optic interfaces, acoustic interfaces, Bluetooth interfaces, Near Field Communication interfaces, infrared interfaces, USB interfaces, Wi-Fi interfaces, TCP/IP interfaces, network communications interfaces, or any conventional communication interfaces. In some cases, the communications I/O 316 may include signals and data received from an external device that has been paired or is otherwise in electronic communication with the device 100. The external data included in the communications I/O 316 may include, for example, message data associated with an electronic communication, notification data associated with an event, and/or data related to audio or visual content. The communications I/O 316 may also include an authorization or identification of external devices in communication with the device 100 or users associated with one or more external devices. Similarly, the communications I/O 316 may be used to output various forms of data or signals to one or more devices or systems that are external to the device 100. For example, the communications I/O 316 may include data or computations that are produced using the biosensor input 320 and/or the sensor input 318.

[0102] FIG. 4 depicts an example wearable electronic device 100 as part of a system of devices. By way of example, the wearable electronic device 100 of FIG. 4 may correspond to the devices shown in any of the previous figures. Generally, the wearable electronic device 100 may communicate wirelessly with any of a number of other devices, such as mobile phone 420, computer 430, tablet computing devices, personal media players, televisions, networked home appliances, networked home controls, electronic systems in vehicles, and so on. Additionally, the wearable electronic device 100 may communicate wirelessly with any of a number of electronic accessories, including headset devices, portable speaker devices, portable microphone devices, display screens, and so on. Communication may be through a wired or wireless connection, including any technology mentioned herein.

[0103] In some embodiments the wearable electronic device 100 may accept a variety of bands, straps, or other retention mechanisms (collectively, “bands”). These bands may be removably connected to the electronic device by a feature formed into the band or band assembly that is accepted in a recess or other aperture within the device and locks thereto. An example band interface is described in more detail below with respect to FIGs. 25A-C.

[0104] In general, a user may change combinations of bands and electronic devices, thereby permitting mixing and matching of the two categories. It should be appreciated that devices having other forms and/or functions may include similar recesses and may releasably mate with a lug and/or band incorporating a lug. In this fashion, a system of bands and devices may be envisioned, each of which is compatible with another. A single band may be used to connect to devices, as one further example; in such embodiments the band may include electrical interconnections that permit the two devices to transmit signals to one another and thereby interact with one another.

[0105] Insofar as the electronic device 100 may connect either physically or through a data communication link with other computing devices, the combination of devices and bands may be thought of as an ecosystem having multiple parts that interact with one another, may intelligently communicate with one another, may share functionality and/or may substitute for one another in terms of operations, output, input and the like. Examples of devices existing in such an ecosystem follow, but are illustrative rather than limiting.

[0106] As one example, a number of electronic devices 100, 420, 430 may each have identical or similar attachment structures that permit them to share a band or connector. A user may thus change the interconnected band and device(s) with respect to one another, permitting a number of different physical connections between different ecosystem components. In some embodiments, a band that serves to retain an electronic device only may be swapped for bands having additional functionalities, such as transmitting data between devices connected to the band, adding functionality to a connected device that the device lacks, providing additional power to a connected device, and so on. Further, different bands may look different, so that the appearance of the electronic device(s) in combination with a band(s) may change by changing the band(s) and/or device(s) with respect to one another.

[0107] As another example, electronic devices 100, 420, 430 may communicate with one another as part of the overall ecosystem. Data may be passed from one device 420 to another 100. This may be useful if the user 410 is wearing one electronic device 100 but is not near another device 430 that wishes to notify the user or interact with the user in some fashion. Continuing the example, the computer 430 may transmit a reminder or message to the wearable device 100 to

gain the user's attention. As another example, the computer 430 (or any other electronic device in the ecosystem) may transmit a state of an application or even the device itself to the wearable device 100. Thus, for example, if an application operating on the computer needs the user's attention, it may be gained through an alert issued by the wearable device.

[0108] Data communication between devices in an ecosystem may also permit the devices to share functionality. As one non-limiting example, electronic devices may share sensor data with one another to permit one device access to data it normally would not have, from a sensor it does not physically incorporate. Thus, any given device 100, 420, 430 may draw on the abilities of other devices in the ecosystem to provide an enhanced and relatively seamless experience for a user 410.

[0109] FIG. 5 depicts a system 500 of interchangeable components for a wearable device. By way of example, one or more of the devices of FIG. 5 may correspond to the devices shown in any of the previous figures. FIG. 5 depicts a system 500 including a variety of interchangeable components, including multiple device bodies 515, 525, 535 that are configured to connect via a standard interface to any one of a number of different bands 551a-b, 552a-b, 553a-b, 554a-b, and 555a-b. In addition, each of the three devices may be configured to connect via a standard interface to another type of non-band component, such as a lug 556a-b, non-band component, or other device.

[0110] As shown in FIG. 5, the system 500 may include a body or device that is adapted to attach to one or more bands, straps, or other similar component that may be used to attach the device to the body of a user. In some embodiments, the device may be interchangeable or interchanged to provide a different set of functions or features. In some embodiments, the bands or attachment components may be interchangeable or interchanged to provide desired functionality or features.

[0111] In the example depicted in FIG. 5, each of the devices includes at least one receiving feature 504 that is configured to interconnect with a corresponding feature 502 that is attached to or integrally formed with the end of each of the bands or other mating parts. In some embodiments, receiving feature 504 includes a channel or groove that is formed in one end of the device body. The mating feature 502 of a respective band or component may be configured to

slidably engage with the receiving feature 504 of a respective device body to attach the band or component. An example receiving feature is described in more detail below with respect to FIGs. 25A-C. In some embodiments, the receiving feature 504 and the mating feature 502 are standardized in the system 500 and, thus, any of the bands (551a-b, 552a-b, 553a-b, 554a-b, and 555a-b) can be interchangeably used with any of the device bodies 515, 525, 535.

[0112] With respect to FIG. 5, each of the bands may be formed from a different material or using a different construction. In the present example, bands 551a-b may be formed from a textile material that may be constructed from a pattern of thread or fiber material. The textile material may include a variety of materials, including natural fibers, synthetic fibers, metallic fibers, and so on. The bands 552a-b may be formed from a woven material and may be constructed from an array of warp fibers or threads interwoven with one or more weft fibers or threads. Similarly, the warp and weft fibers may include a variety of materials, including natural fibers, synthetic fibers, metallic fibers, and so on. The bands 553a-b may be formed from leather material 553a-b. In one example, the bands 553a-b are formed from a sheet or strip of cowhide; however, the bands 553a-b may also be formed from one of any number of types of animal hide. The leather material 553a-b may also include a synthetic leather material, such as vinyl or plastic. The bands 554a-b may be formed from a metallic mesh or link construction. For example the bands 554a-b may be formed from a Milanese mesh or other similar type of construction. The bands 555a-b may be formed from a silicone or other elastomer material.

[0113] In some cases, the band is a composite construction including various materials, which may be selected based on the end use or application. In some embodiments, a first band strap, or a first portion of the first band strap, may be made up of a first material and a second band strap, or a second portion of the second band strap, may be made from a second, different material. The band may also be made up of a plurality of links and, as such, the band may be resizable by, for example, adding or removing links. Example bands and band constructions are provided below in Section 12.

[0114] In the system 500, an interchangeable band may allow for individual customization of the device or to better adapt the device for a range of uses or applications. In some instances, the type of band that is selected and installed can facilitate a particular user activity. For example,

band 551a-b may be formed from a textile material and include a durable clasp that may be particularly well suited for exercise or outdoor activities. Alternatively, as discussed above the band 554a-b may be formed from a metallic material and include a thin or low-profile clasp that may be well suited for more formal or fashion-focused activities.

[0115] In some embodiments, the band may be coupled to a separate component having the mating feature 502. The band may be coupled using pins, holes, adhesives, screws, and so on. In yet other embodiments, the band may be co-molded or overmolded with at least a portion of the component having the mating feature 502. In some embodiments, the band is coupled to the component via a pin that allows the straps to rotate with respect to the component. The pin may be formed integrally with or disposed in a loop formed in the end of the band.

[0116] In the example system 500, each of the bands is shown as having a generic band clasp. However, the type of band clasp that is used may vary between embodiments. On example band clasp may include a first band strap having a buckle or tang assembly which is configured to interface with a second band strap having a series of apertures or holes formed with the strap. Additionally or alternatively, the bands may include a magnetic clasp having one or more magnetic elements on a first band strap that is configured to mate to one or more magnetic or ferromagnetic elements on a second band strap.

[0117] As shown in FIG. 5, the system may include multiple device bodies 515, 525, 535 that may vary in size, shape, and composition. The device body 515, 525, 535 may include one or more of the embodiments described herein and may include, but is not limited to a wearable computer, a wearable watch, a wearable communication device, a wearable media player, a wearable health monitoring device, and/or the like. In particular, the device body may correspond to the device body described with respect to device body 610 of device 100 (shown in FIG. 6).

1. Example Wearable Electronic Device

[0118] FIG. 6 depicts an example wearable electronic device, which may include various aspects of the device(s) described above. In some embodiments, multiple modules or subsystems are physically and operationally integrated together to provide particular functionality or device

features. In particular, the interaction between the subsystems, or the subsystems themselves, may be configurable by the user, manufacturer, or vendor to adapt the device to produce certain functionality. Some example combinations and interactions between the various modules and subsystems are expressly provided in the present description. However, the combinations and interactions provided herein are merely illustrative in nature and are not intended to be limiting on the scope of the disclosure.

[0119] FIG. 6 depicts an example configuration of a wearable electronic device 100. In particular, FIG. 6 depicts an electronic wearable device 100 including a device body 610 that may be configured to be attached to the wrist of a user using a band assembly 620. This configuration may also be referred to herein as a wearable device, a device, an electronic wristwatch, or an electronic watch. While these terms may be used with respect to certain embodiments, the functionality provided by the example electronic wearable device 100 may be substantially greater than or vary with respect to many traditional electronic watches or timekeeping devices.

[0120] In the present example, the exterior surface of the device body 610 is defined, in part, by the exterior surface of the housing 601 and the exterior surface of the cover 609. In the example depicted in FIG. 6, the device body 610 is substantially rectangular with round or curved side portions. The outer surfaces of the cover 609 and the housing 601 coincide at a joint interface and cooperate to form a continuous contoured surface. The continuous contoured surface may have a constant radius and may be tangent to a flat middle portion of the cover 609 and/or a flat bottom portion of the housing 601. In some embodiments, the cover 609 has substantially the same shape as a flat bottom portion and at least a portion of the curved side portions of the housing 601. A more complete description of the geometry of the cover 609 and the housing 601 is provided below with respect to FIGs. 7 and 8.

[0121] In the example of FIG. 6, the device 100 includes a display (item 120 of FIG. 2) that is disposed at least partially within an opening or cavity defined within a top portion of the housing 601 of the device body 610. The display may be formed from a liquid crystal display (LCD), organic light emitting diode (OLED) display, organic electroluminescence (OEL) display, or other type of display device. The display may be used to present visual information to the user

and may be operated in accordance with one or more display modes or the software applications being executed on the device 100. By way of example, the display may be configured to present the current time and date similar to a traditional watch or timepiece. The display may also present a variety of other visual information that may correspond to or be produced using one of the other modules in the device 100. For example, the display may be configured to display one of a variety of notification messages, which may be generated based on data received from the one or more sensors, the wireless communication system, or other subsystem of the device 100. The display may also be configured to present visual information or data that is based on the output of one or more sensor outputs. The display may also provide status or information related to a wireless charging process or battery power. The display may also present visual output or information related to media being produced using a speaker or acoustic module of the device 100. Accordingly, a variety of other types of visual output or information may be presented using the display.

[0122] In the current example, the display includes or is integrated with a cover 609 that helps to protect the display from physical impact or scratches. In the field of wearable devices, the cover 609 may also be referred to generically as a crystal or cover glass, regardless of the material that is used to form the cover 609. In some cases, the cover 609 is formed from a sheet or block of sapphire material. Sapphire may provide superior optical and surface hardness properties as compared to other materials. In some cases, the sapphire material has a hardness of approximately 9 on the Mohs scale. In alternative embodiments, the cover 609 is formed from a glass, polycarbonate, or other optically transparent material. The cover 609 may also be coated with one or more optical or mechanical enhancing materials or surface treatments. For example, interior and/or exterior surfaces of the cover 609 may be coated with an anti-reflective (AR), oleophobic or other coating to enhance the visible or functional properties of the display. Additionally, in some cases, the cover 609 may be configured to cooperate with an antenna used to facilitate wireless communication with an external device. FIGs. 21A-B, described in more detail below, provide one example embodiment of a cover configured to cooperate with an antenna.

[0123] In the example depicted in FIG. 6, the cover 609 is formed from a transparent material and, when assembled has an external surface and an internal surface. The cover 609 is disposed

above the display and encloses a cavity or opening formed in the top portion of the housing 601. In some embodiments, the external surface of the cover 609 cooperates with the external surface of the housing to form a substantially continuous external peripheral surface of the electronic device. As shown in FIG. 6, the external surface of the cover 609 has a flat middle portion at the center of the cover, which extends outwardly. The cover 609 also includes a curved edge portion that emanates from and surrounds the flat middle portion and extends outwardly to an edge at the side of the cover 609. In some embodiments, the cover 609 also includes an opaque mask disposed relative to the internal surface of the transparent cover. The opaque mask may correspond to or otherwise define the viewable area of the display 120. The mask may have an outer boundary that is located proximate the edge of the side of the cover 609 and has an inner boundary located within the curved edge portion of the cover 609.

[0124] As shown in FIG. 6, the cover 609 is disposed relative to a top portion of the housing 601. The housing 601 includes a top portion defining an opening, which is surrounded by a curved side portion. In the present example, the curved edge portion of the cover 609 coincides with the curved side portion of the housing 601 to form a continuous external surface of the electronic device 100. In some instances, the cover 609 may have a contour that follows or otherwise corresponds to a similar contour of the housing 601 to form a substantially continuous surface at the interface between the two components. As shown in FIG. 6, the cover 609 protrudes above the housing 601.

[0125] In some instances, the cover 609 is disposed relative to a touch sensor (item 702 of FIG. 7). In some embodiments, the touch sensor may be integrated with the display or other element of the device 100. The touch sensor may be formed from one or more capacitive sensor electrodes or nodes that are configured to detect the presence and/or location of an object or the user's finger that is touching or nearly touching the surface of the display. In some cases, the touch sensor includes an array of sensing nodes formed in accordance with a mutual capacitance sensing scheme.

[0126] In one example, the touch sensor may include an array of mutual capacitance touch nodes that can be formed by a two-layer electrode structure separated by a dielectric material. One layer of electrodes may comprise a plurality of drive lines and another layer of electrodes may

comprise a plurality of sense lines, and where the drive lines and the sense lines cross, mutual capacitive sense nodes are formed (also referred to as coupling capacitance). In some implementations, the drive lines and sense lines may cross over each other in different planes separated from one another by a dielectric. Alternatively, in other embodiments the drive lines and sense lines can be formed substantially on a single layer. An example touch sensor and touch-sensing node are described in more detail below with respect to FIGs. 14A-C and 15A-B.

[0127] Alternatively or additionally, the touch sensor may include one or more self-capacitive nodes or electrodes that are configured to detect a discharge of electrical current or charge when an object, such as a user's finger, contacts or nearly contacts a surface of the housing 601 or other surface of the device 100. Other types of electronically sensing nodes, including resistive, inductive, or the like, may also be integrated into a surface of the device 100.

[0128] In some embodiments, the device 100 may also include a force sensor (item 705 of FIG. 7). The force sensor may be disposed relative to the display 120 or integrated with other elements of the device 100. In some cases, the force sensor includes one or more force sensing structures or force-sensing nodes for detecting and measuring the magnitude of a force or pressure due to a touch on a surface of the device 100. The force sensor may be formed from or implement one or more types of sensor configurations. For example, capacitive and/or strain based sensor configurations may be used alone or in combination to detect and measure the magnitude of a force or pressure due to a touch. As described in more detail below, a capacitive force sensor may be configured to detect the magnitude of a touch based on the displacement of a surface or element on the device. Additionally or alternatively, a strain-based force sensor may be configured to detect the magnitude of a touch based on the deflection. Example force sensor and force-sensing modules are described in more detail below with respect to FIGs. 9-12.

[0129] As shown in FIG. 6, the device 100 also includes device body 610 including a housing 601 that upon which may be mounted or integrated with various components of the device 100. The housing 601 serves to surround at a peripheral region as well as support the internal components of the product in their assembled position. In some embodiments, the housing 601 may enclose and support internally various components (including for example integrated circuit chips and other circuitry) to provide computing and functional operations for the device 100.

The housing 601 may also help define the shape or form of the device. That is, the contour of the housing 601 may embody the outward physical appearance of the device. As such, it may include various ornamental and mechanical features that improve the aesthetical appearance and tactile feel of the device. For example, the housing 601 may include a contoured surface that includes rectilinear contours, curvilinear contours, or combinations thereof. The housing 601 may also include various surface features, including textures, patterns, decorative elements, and so on.

[0130] In the present example, the housing 601 is formed from a single piece, which may also be referred to as single-body, unitary, or uni-body design or construction. By utilizing a single-body construction, the structural integrity of the device may be improved as compared to a multi-piece construction. For example, a single body may be more easily sealed from contaminants as compared to a multi-piece enclosure. Additionally, a single-body enclosure may be more rigid due, in part, to the absence of joints or seams. The rigidity of the housing 601 may be further enhanced by increasing the material thickness in areas where mechanical stress may be greatest, while also maintaining or thinning other areas where mechanical stress may be lower or reduced. Variations in the thickness of the housing 601 may be possible by machining or casting the housing 601 as a single piece. Additionally, a single-body housing 601 may include one or more features for mounting or integrating the internal components of the device 100, which may facilitate manufacturing and/or assembly of the device 100.

[0131] An example housing 601 is described in more detail below with respect to FIG. 8. The housing 601 may be formed from a variety of materials, including, without limitation plastic, glass, ceramics, fiber composites, metal (e.g., stainless steel, aluminum, magnesium), other suitable materials, or a combination of these materials. Further, the housing 601 may include a surface treatment or coating, which may be formed from a variety of materials, including, without limitation aluminum, steel, gold, silver and other metals, metal alloys, ceramics, wood, plastics, glasses, and the like.

[0132] As discussed above, the display, the touch sensor, and force sensor may be disposed within the housing 601. In this example, one or more buttons 644 and a crown 642 used to receive user input may also be disposed within or relative to the housing 601. Other types of

user input, including for example, one or more dials, slides, or similar user input devices or mechanisms may also be disposed within or relative to the housing 601. As described in more detail with respect to FIGs. 7 and 8, the housing 601 may include various features for attaching and mounting the subassemblies and modules of the device 100. In particular, the housing 601 may have one or more openings for receiving the cover 609, the display, the force sensor, or other components. The housing 601 may also include one or more holes or openings for receiving the button 644 and crown 642 that are located around the perimeter of the device 100. In some embodiments, the housing 601 also includes internal features, such as bosses and threaded portions, that can be used to attach modules or components within the housing 601.

[0133] The device 100 may also include an ambient light sensor (ALS) that is configured to detect and measure changes in ambient lighting conditions. The ALS may include a photodiode and one or more optical elements or lenses for collecting light. An ALS may be located on an external facing surface that is less likely to be blocked when the device is worn or in use. The ALS may be used to adjust settings, including screen brightness and other visual output depending on the overall lighting conditions.

[0134] The housing 601 may also include one or more motion-sensing elements or devices for detecting motion of the device 100. For example, the device 100 may include one or more accelerometers that are configured to sense acceleration or changes in motion. Additionally or alternatively, the device 100 may include one or more gyroscopic sensors that are configured to detect changes in direction. In some cases, the one or more gyroscopic sensors may include a spinning mass that can be used to detect changes in angular velocity. Multiple motion-sensing elements may be used to detect motion along multiple directions or axes. The motion sensors may also be used to identify motion gestures. For example, the motion sensors can be used to detect an arm raise or the position of a user's body (within a predetermined confidence level of certainty). The one or more motion-sensing elements may be used to determine an orientation of the device relative to a known or fixed datum. For example, the device may include a compass and/or global positioning system (GPS) that can be used to identify an absolute position. The one or more motion sensing elements may then measure deviation or movement with respect to the absolute position to track movement of the device or the user wearing the device. In some implementations, the one or more motion-sensing elements are used to detect gross movement of

the device or user. The gross movement may be used as a pedometer or activity meter, which may be tracked over time and used to calculate a health metric or other health-related information.

[0135] Described in more detail with respect to FIG. 8, the housing 601 may also include one or more openings or orifices coupled to an acoustic module or speaker 122, which may include a speaker and/or a microphone subassembly. Although the housing 601 may include one or more openings or orifices, the housing 601 may still be substantially waterproof/water resistant and may be substantially impermeable to liquids. For example, the opening or orifice in the housing or enclosure may include a membrane or mesh that is substantially impermeable to liquid ingress. Additionally or alternatively, the geometry of the opening or orifice and other internal features of the housing 601 may be configured to reduce or impede the ingress of liquid or moisture into the device 100. In one example, the opening is formed from one or more orifices that are offset with respect to an internal acoustic chamber or cavity, which may prevent a direct path from the outside of the housing 601 into the acoustic module.

[0136] As shown in FIG. 6, the device 100 includes a device body 610 that may be attached to a user's wrist using a band 620. In the present example, the band 620 include a first band strap 621 attached to a first receiving feature 623 and a second band strap 622 attached to a second receiving feature 624. In some embodiments, the first and second band straps 621, 622 include a lug feature that is configured to attach to the first and second receiving features 623, 624, respectively. As shown in FIG. 6, the free ends of the band straps 621, 622 are connected with a clasp 625.

[0137] The band straps 621, 622 are formed from a flexible or compliant material that may be specially configured for a particular application. The band straps 621, 622 may be formed from a variety of materials, including, for example, leather, woven textiles, or metallic mesh materials. The material and construction of the band straps 621, 622 may depend on the application. For example, the band straps 621, 622 may be formed from a woven textile material configured for exposure to impact and moisture typically associated with outdoor activities. In another example, the band straps 621, 622 may be formed from a metallic mesh material that may be

configured to have a fine finish and construction that may be more appropriate for professional or social activities.

[0138] Similarly, the clasp 625 of the band 620 may be configured for a particular application or to work with a particular style of band. For example, if the band straps 621, 622 are formed from a metallic mesh material, the clasp 625 may include a magnetic clasp mechanism. In the present example, the device 100 is configured to be attached to the wrist of a user. However, in alternative embodiments, the device may be configured to be attached to the arm, leg or other body part of the user.

[0139] The housing 601 includes one or more features for attaching the band straps 621, 622. In the present example, the housing 601 includes a first receiving feature 623 and a second receiving feature 624 for attaching the first band strap 621 and the second band strap 622, respectively. In this example, the band straps 621, 622 include a lug portion that is adapted to mechanically engage with the receiving features 623, 624. A more detailed description of the receiving features and lugs is provided below with respect to FIGs. 25A-C. As shown in FIG. 6, the first 623 and second receiving features 624 may be integrally formed into the housing 601. In alternative embodiments, the receiving features may be formed from separate parts and may be attached to the housing 601 during manufacturing. In some embodiments, the receiving features 623, 624 may be configured to release the band straps 621, 622 from the device body 610 (e.g., the housing 601). For example, one or both of the receiving features 623, 624 may include a button or slide, which may be actuated by the user to release a corresponding band strap 621 and 622. One advantage of a releasable lug is that the user can swap between a variety of bands that may be specially configured for a particular use scenario. For example, some bands may be specially configured for sport or athletic activities and other bands may be configured for more formal or professional activities.

[0140] The device 100 may also include a rear cover 608 located on the rear-facing surface of the housing 601 of the device body 610. The rear cover 608 may improve the strength and/or scratch resistance of the surface of the device 100. For example, in some embodiments, the rear cover 608 may be formed from a sapphire sheet, zirconia, or alumina material having superior scratch resistance and surface finish qualities. In some cases, the sapphire material has a

hardness greater than 6 on the Mohs scale. In some cases, the sapphire material has a hardness of approximately 9 on the Mohs scale. Due to the superior strength of the sapphire material, a cover glass formed from a sapphire sheet may be very thin. For example, the thickness of a sapphire cover sheet may be less than 300 microns thick. In some cases, the thickness of a sapphire cover sheet may be less than 100 microns thick. In some cases, the thickness of a sapphire cover sheet may be less than 50 microns thick. In some embodiments, the rear cover 608 is contoured in shape. For example, the rear cover 608 may have a convex curved surface.

[0141] FIG. 7 depicts an example exploded view of various modules and subassemblies of the device 100. As shown in FIG. 7, multiple components are configured to be disposed within and/or attached to the housing 601. The exploded view provided in FIG. 7 depicts one example arrangement of the components of the device 100. However, in other embodiments, arrangement, placement, and/or grouping of the subassemblies and the components of the subassemblies may vary.

[0142] In the present example, a main cavity of the housing 601 houses an electronics subassembly 720 and the battery 114 of the device. The electronics subassembly 720 includes one or more electrical circuit assemblies for coupling the various electrical components of the device 100 to each other and to power supplied by the battery 114. The electronics subassembly 720 may also include structural elements or components that provide structural rigidity for the electronics subassembly 720 and/or structural mounting or support for other components disposed within the housing 601. As shown in FIG. 7, within the cavity of the housing 601, the speaker 122, the crown module 642, and the battery 114 are all disposed above the electronics subassembly 720. In the present embodiment the top surface of the speaker 122, the crown module 642, and the battery 114 have a substantially similar height. In some embodiments, the speaker 122, the crown module 642, and the battery 114, when assembled in the housing 601, define an area for the display 120 within the cavity. Thus, as shown in FIG. 7, the display 120 may overlay the speaker 122, the crown module 642, and the battery 114, which overlay the electronics subassembly 720.

[0143] As shown in FIG. 7, the cover 609 is configured to fit within a corresponding recess formed within the housing 601. In particular, the cover 609 includes a vertical portion having a

height that corresponds to the depth of the recess formed within the housing 601. In this example, the device 100 includes a force sensor 705 disposed between the housing 601 and a cover subassembly 704. As described in more detail below with respect to FIGs. 9 and 10A-B, the force sensor 705 may be configured to detect a force placed on a surface of the cover 609 by detecting a relative deflection between the cover 609 (or cover subassembly 704) and the housing 601. In the present example, the force sensor 705 also forms a gasket or seal between the cover subassembly 704 and the housing 601. In some implementations, the seal is a water-proof or water-resistant seal that helps to prevent water or liquid ingress into the internal cavity of the housing 601. The force sensor 705 may also be used to join the cover subassembly 704 to the housing 601 using an adhesive or film.

[0144] In some embodiments, the cover subassembly 704 includes the cover 609 which is disposed above the touch sensor 702 and display 120. In the present example, the touch sensor 702 and the display 120 are attached to each other by an optically clear adhesive layer (OCA). Similarly, an OCA layer is used to attach the touch sensor 702 to the cover 609. Other adhesives or bonding techniques may be used to attach the display 120 and the touch sensor 702 to the cover 609. In some embodiments, the touch sensor 702 is integrated into the display 120 and the display 120 (and integrated touch sensor 702) are attached to the cover 609.

[0145] As shown in FIG. 7, the speaker 122 is also disposed within the cavity of the housing 601. The speaker 122 is adapted to mechanically and acoustically interface with a port formed in the side of the housing 601. In some embodiments, the port is configured to prevent a direct path for water or liquid into an acoustic chamber or cavity of the speaker 122. In some embodiments, the device 100 also includes a microphone that is similarly coupled to another port formed in the side of the housing 601. A more detailed description of the speaker 122 and microphone is provided below with respect to the acoustic module of FIG. 20.

[0146] In the present example, the haptic device 112 is also disposed within the cavity of the housing 601 proximate to the speaker 122. In some embodiments, the haptic device 112 is rigidly mounted to a portion of the housing 601. A rigid mounting between the housing 601 and the haptic device 112 may facilitate the transmission of vibrations or other energy produced by the haptic device 112 to the user. In the present example, the haptic device 112 includes a

moving mass that is configured to oscillate or translate in a direction that is substantially parallel with a rear face of the housing 601. In some implementations, this orientation facilitates the perception of a haptic output produced by the haptic device 112 by a user wearing the device 100. While this configuration is provided as one example, in other implementations, the haptic device 112 may be placed in a different orientation or may be configured to produce a haptic response using a rotating mass or other type of moving mass.

[0147] As shown in FIG. 7, the device also includes an antenna subassembly 722. In this example, a portion of the antenna subassembly 722 is disposed within the housing 601 and a portion of the antenna subassembly 722 is disposed within the cover assembly. In some implementations, a portion of the antenna subassembly 722 is disposed relative to a feature formed within the cover 609. An example embodiment is described in more detail below with respect to FIGs. 21A-B.

[0148] In the example depicted in FIG. 7, the device 100 also includes a crown module 642 which is disposed in an aperture or hole in the housing 601. When installed, a portion of the crown module 642 is located outside of the housing 601 and a portion of the crown module 642 is disposed within the housing 601. The crown module 642 may be configured to mechanically and/or electrically cooperate with the electronics subassembly 720. A more detailed description of an example crown module is provided below with respect to FIGs. 23 and 24A-B. The housing 601 also includes a button 644, which is disposed in an opening of the housing 601 and may be configured to mechanically and/or electrically cooperate with the electronics subassembly 720.

[0149] In the example depicted in FIG. 7, a biosensor module 710 is disposed in an opening formed in the rear surface of the housing 601. In some embodiments, the biosensor module 710 includes the rear cover 608 and may also include a chassis or plate that facilitates attachment of the biosensor module 710 to the housing 601. The chassis or plate or the cover sheet 608 may also include features or elements that facilitate a watertight seal between the biosensor module 710 and the housing 601. For example, the rear cover 608 may include a shelf or flange that may be used to form a seal between the biosensor module 710 and the housing 601. As described in more detail below with respect to FIG. 16, the biosensor module 710 may include one or more

light sources, one or more photodetectors, and one or more electrodes or conductive elements that are configured to detect and measure a physiological condition or property of the user.

[0150] In some embodiments, the rear cover 608 has an edge that protrudes outwardly from the back surface of the housing 601. The rear cover 608 may also have a convex curved area located between the edges of the rear cover 608. The convex curved area of the rear cover 608 may include one or more windows or apertures that provide operational access to one or more internal components located within the housing 601. In some embodiments, the windows have a curvature that matches the curvature of the convex curved area of the rear cover.

2. Example Housing

[0151] As described above, a wearable electronic device may include a device body that includes a housing or enclosure shell. As previously described, the housing may function as a chassis that physically integrates the various components of the device. The housing may also form a protective shell or housing for the components and function as a barrier against moisture or debris. In the present examples, the housing is formed as a uni-body, unitary, or single body or component. A single-body construction may be advantageous by providing mounting features directly into the housing, which may reduce space, reduce part count, and increase structural rigidity as compared to some alternative configurations. Additionally, a single-body construction may improve the housing's ability to prevent the ingress of moisture or debris by reducing or eliminating seams or joints between external components.

[0152] FIG. 8 depicts an example housing 601 in accordance with some embodiments. In the present example, the housing 601 is formed as a single body or component. As shown in FIG. 8, the housing 601 is formed as a single part or body. The housing 601 may be formed, for example, by machining or shaping a solid or cast blank having the approximate shape of the housing 601. In some implementations, the housing 601 may be configured to provide structural integrity for potentially delicate internal components and also withstand a reasonable impact.

[0153] In the present embodiment, the housing 601 is formed as a uni-body, unitary, or single-body construction having a flat bottom portion 801 and a top portion including flange 812. The top portion defines an internal cavity 805, which is surrounded by four sides 802a-d that are

integrally formed with the bottom portion 801. The internal cavity 805 can also be described as being defined by the top portion, the four sides 802a-d and the bottom portion 801. In this example, the internal cavity 805 has a rectangular (square) shape, although the specific shape may vary with different implementations. In the present example, the four sides 802a-d define a curved side portion of the housing 601 that extends from the bottom portion 801 to the top portion of the housing 601. Each side 802a-d is orthogonal to an adjacent side and each side 802a-d is connected to an adjacent side by a rounded corner. For example, side 802a is orthogonal to two adjacent sides 802b and 802d and is connected to those sides by respective rounded corners. The shape or contour of the rounded corners may correspond to the curvature of the curved portion of the housing 601. Specifically, the curvature of the rounded corners may match or correspond to the curvature of the continuous external surface formed by the housing 601 and the cover 609, as described above with respect to FIG. 6.

[0154] The sides 802a-d may vary in thickness in order to provide the structural rigidity for the device. In general, areas of high stress may have an increased material thickness as compared to areas of low stress, which may have a reduced material thickness. In particular, portions of the sides 802a-d near the bottom portion 801 may have an increased thickness as compared to portions of the sides 802a-d located further away from the bottom portion 801. This configuration may improve the structural rigidity and overall stiffness of the housing 601.

[0155] As shown in FIG. 8, one or more mounting features may be formed directly into the housing 601, which may reduce the number of parts and also enhance the structural integrity of the device. As shown in FIG. 8, receiving features 623, 624 may be formed as channels or openings that are configured to receive an end of a band (e.g., a lug) having a mating feature. As described above with respect to FIG. 5, the receiving features 623, 624 may be standardized and configured to work with a system of interchangeable components. Forming the receiving features 623, 624 directly into the housing 601 may reduce parts and also facilitate structural rigidity of the device.

[0156] In the example depicted in FIG. 8, the housing 601 can be described as having two ends (a first end and a second end opposite the first end), and a first side and a second side opposite the first side, the sides being continuous with the ends. In this example, the first and second ends

and the first and second sides having an outwardly curved three-dimensional shape. In this example, the receiving feature 623 is formed from a first groove situated in the first end. Similarly, the receiving feature 624 is formed from a second groove situated in the second end. In the present example the grooves have openings at the interface of the first and second sides and first and second ends. As shown in FIG. 8 the groove also has an inwardly curved concave three-dimensional shape with an undercut feature. For example, the middle portion of the groove of receiving features 623, 624 may have a width that is greater than the opening of the receiving features 623, 624. In some embodiments, the upper portion of the housing overhangs the lower portion of the housing at the groove opening. In the example depicted in FIG. 8, the groove is cut into a solid portion of the housing such that the groove forms a continuous interior shape.

[0157] The geometry of the receiving features may be located with respect to other features or components of the device. In the example depicted in FIG. 8, at least a portion of the groove of the receiving features 623, 624 may be disposed underneath the cover (item 609 of FIGs. 6-7). With respect to FIG. 6, the groove of the receiving features 623, 624 is located underneath the opening for the cover, which is defined by the sealing ledge 810 and flange 812 formed in the upper portion of the housing 601. In some embodiments, the length of the groove extends further than the width of the opening configured to receive the cover (and thus the cover, when assembled). In some embodiments, the grooves are formed at an angle relative to the centerline of the housing. In some cases, the angle is approximately 5 degrees. In some embodiments, the groove is located underneath the centerline of the housing 601. In some embodiments, the groove is angled upward toward the top of the housing 601 and inward toward the center of the housing 601. The groove 601 may angle upward and cross the centerline of the housing. In some cases, the groove crosses the vertical centerline of the housing 601.

[0158] In the present embodiment, the housing 601 also includes an aperture 821 formed into the side 802c of the housing 601 for attaching a crown or crown module (item 642 of FIGs. 6-7). In some embodiments, the aperture 821 for the crown is offset upwardly from the centerline of the housing 601. In some embodiments, the aperture 821 for the crown is positioned such that an upper portion of a crown (when installed) is higher than the interface of cover 609 and housing 601. With respect to FIG. 6, the interface may correspond to the upper edge of the flange 812.

[0159] The housing 601 also includes an opening 822 formed into the side 802c of the housing 601 for attaching the button (item 644 of FIGs. 6-7). In some embodiments, the aperture 821 for the crown and the opening 822 for the button are disposed with the length defined by a flat part of the cover. In some embodiments, the aperture 821 for the crown is disposed above the centerline of the housing 601 and the opening 822 for the button is disposed below the centerline of the housing 601. In some embodiments, the aperture 821 for the crown and the opening 822 for the button are disposed on a curved surface of the housing 601. The housing 601 may also include various other internal features, including threaded features and bosses, for attaching other internal components of the device.

[0160] In some cases, the housing 601 may be formed as a single-piece or integral enclosure shell to enhance the structural rigidity and/or liquid-sealing properties of the device. As described above with respect to FIGs. 6 and 7, the housing 601 may be integrated with a cover (e.g., crystal) and other external components to provide a substantially sealed housing. In the present embodiment, the housing 601, includes a sealing ledge 810 formed around the perimeter of the main cavity 805 formed within the housing 601. In some embodiments, the sealing ledge 810 (and thus the cover when installed) is located in the center of the housing 601. The sealing ledge 810 may be defined by a substantially flat portion 811 that is adapted to form a seal between the housing 601 and another component (e.g., the force sensor 705 or cover 609 of FIGs. 6-7). The sealing ledge 810 may be formed at a depth that is substantially similar or corresponds to the thickness of the mating cover.

[0161] As shown in FIG. 8, the sealing ledge 810 may also include flange 812 that protrudes from the flat portion and forms a continuous surface with the side walls 802a-d. In some cases, the flange 812 is configured to cooperate with the cover (item 609 of FIGs. 6-7) to form a substantially continuous surface. In some implementations, the sides 802a-d and the cover or crystal are configured to cooperate or mechanically interface to improve the strength and the water sealing properties of the device.

[0162] As also shown in FIG. 8, an opening or aperture 815 may be formed in the bottom portion 801 of the housing 601. In some embodiments, the opening or aperture 815 is located at the center of the housing 601. As described above with respect to FIG. 7, the aperture 815 may be

used to integrate a sensor array or other module used to collect measurements that may be used to compute a health metric or other health-related information. The present embodiment may be advantageous by integrating multiple components in a single opening 815, which may facilitate a water-proof or water-resistant property of the device. Additionally, by integrating a sensor array into a module that attaches via the opening 815, same housing 601 may be used with a variety of sensing configurations or arrays. For example, the number or sensors or components may be increased or decreased without modifying the housing 601. This may allow for flexibility in the product development and may facilitate upgrades as new sensing configurations are available.

[0163] As previously discussed above with respect to FIGs. 6-7, the housing 601 may also be configured to serve as a protective housing for one or more acoustic elements, such as a microphone or speaker. Additionally, in some embodiments, the housing 601 may also be configured to inhibit the ingress of foreign particulate or moisture. In particular, the housing 601 may include a speaker port having orifices 831, 832 that are configured to transmit acoustic signals but also prevent the ingress of liquid or other foreign particulate. In the present example, the speaker port includes orifices 831, 832 that are offset with respect to an acoustic chamber or cavity to prevent the direct ingress of liquid into the speaker subassembly or acoustic module. In the present example, a shielding or umbrella portion of the housing, which is substantially free of openings, is formed between the orifices 831, 832, which helps to prevent the direct ingress of liquid. Similarly, the housing 601 includes a microphone port having orifices 833, 834 that are offset from a corresponding acoustic chamber or cavity to prevent the direct ingress of liquid into the microphone subassembly or acoustic module.

[0164] In the example depicted in FIG. 8, the orifices 831, 832 of the speaker port are located on one side of the aperture 821 for the crown and the orifices 833, 834 for the microphone are located on the other side of the aperture 821. Both the orifices 831, 832 of the speaker port and the orifices 833, 834 for the microphone are located on a curved portion of the housing 601.

3. Example Force Sensor and Touch Sensor

[0165] As discussed previously, a wearable electronic device may include one or more sensors for detecting the location and force of a touch. For the purposes of the following description of the force sensor and touch sensor, the described device 100 is one example of that shown and

discussed above with respect to FIGs. 2-7. However, certain features of the device 100 including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0166] In some embodiments, a force sensor and a touch sensor may be disposed relative to the display of a wearable electronic device for to form a touch-sensitive surface. The following description is provided with respect to individual force and touch sensors that may be used to determine the force and location of a touch, respectively. However, in some embodiments, a single integrated sensor may be used to detect both the force and location of a touch on the device.

[0167] In one embodiment, an output from a force sensor may be combined with a touch sensor to provide both location and force of a single touch or of multiple touches on the surface of a device. In an alternative embodiment, a hybrid or integrated force and touch sensor may be used to sense both touch force and location of a single touch or of multiple touches. In either embodiment, by sensing both the force and location of a touch, multiple types of user input may be generated and interpreted. In one example, a first touch may be correlated with a first force and a first touch location or gesture. Based on the magnitude of the force, the first touch may be interpreted as a first type of input or command. A second touch may be sensed as having a second, different force and a similar location or gesture as the first touch. Based in part on the magnitude of the second force, the second touch may be interpreted as a second type of input or command. Thus, a force sensor (alone or in combination with another touch sensor) may be used to produce different responses or outputs depending on the force of the touch.

[0168] The one or more force sensors may be formed from or may be implemented as one or more types of sensor configurations. For example, capacitive and/or strain based sensor configurations may be used alone or in combination to detect and measure the magnitude of a touch. As described in more detail below, a capacitive force sensor may be configured to detect the magnitude of a touch based on the displacement of a surface or element on the device. Additionally or alternatively, a strain-based force sensor may be configured to detect the magnitude of a touch based on a deflection of the surface, such as the cover glass.

[0169] By way of example, the force sensor may include a capacitive force sensor, which may be formed from one or more capacitive plates or conductive electrodes that are separated by a compressible element or other compliant member. As a force is applied to a surface of the device, the compressible element may deflect resulting in a predictable change in the capacitance between the plates or electrodes. In some implementations, a capacitive force sensor may be formed from transparent materials and disposed over the display. In other implementations, a capacitive force sensor may be formed from non-transparent materials and disposed beneath or around the perimeter of a display.

[0170] FIG. 9 depicts a detail cross-sectional view of a portion of a force sensor 900 that may be arranged around the perimeter of a display 120. As shown in FIG. 9, a force-sensing structure 901 of the force sensor 900 may be disposed beneath the cover 609 and along the side of an edge or the perimeter of the display 120. In this example, the force sensor 900 is configured to detect and measure the force of a touch on the surface 911 of the cover 609. In the present embodiment, a first capacitive plate 902 is fixed with respect to the cover 609. A second, lower capacitive plate 904 is fixed with respect to the housing 601 and may be disposed on a shelf or mounting surface located along the perimeter of the device. The first capacitive plate 902 and the second capacitive plate 904 are separated by a compressible element 906.

[0171] In the configuration depicted in FIG. 9, a touch on the surface 911 of the device may cause a force to be transmitted through the cover 609 of the device and to the force sensor 900. In some cases, the force causes the compressible element 906 to compress, thereby bringing the first capacitive plate 902 and the second capacitive plate 904 closer together. The change in distance between the first and second capacitive plates 902, 904 may result in a change of capacitance, which may be detected and measured. For example, in some cases, a force-sensing circuit may measure this change in capacitance and output a signal that corresponds to the measurement. A processor, integrated circuit or other electronic element may correlate the circuit output to an estimate of the force of the touch. Although the term "plate" may be used to describe certain elements, such as the capacitive plates or conductive electrodes, it should be appreciated that the elements need not be rigid but may instead be flexible (as in the case of a trace or flex).

[0172] FIG. 10A depicts an example configuration of the force sensor 1000 having four individual force-sensing structures 1001a-d arranged around the perimeter of a display in a device. For the sake of clarity, the crystal, display, and other elements of the device are omitted from the depiction of FIG. 10A. Each of the force-sensing structures 1001a-d may be formed from a pair of capacitive plates separated by a compressible element. Additionally, each force-sensing structure 1001a-d may be separated by a small gap at or near the corners of the opening in the housing 601. In the example depicted in FIG. 10A, the four individual force-sensing structures 1001a-d may each be operatively coupled to force-sensing circuitry that is configured to detect a change in the capacitance of each force-sensing structure 1001a-d. Using the example arrangement depicted in FIG. 10A, the approximate location of the touch may be determined by comparing the relative change in capacitance of each force-sensing structure 1001a-d. For example, a change in capacitance of structure 1001b that is larger as compared to a change in capacitance of structure 1001d may indicate that the touch is closer to structure 1001b. In some embodiments, the degree of the difference in the change in capacitance may be used to provide a more accurate location estimate.

[0173] While the configuration shown in FIG. 10A depicts the force-sensing structures as individual elements separated by a small gap, in some embodiments, the force-sensing structure may be formed as a single continuous piece. FIG. 10B depicts a force sensor 1050 formed as a single force-sensing structure 1051 formed as a continuous part along the perimeter of the display. Similar to the example described above, the force-sensing structure 1051 may be operatively coupled to force sensing circuitry that is configured to detect a change in the capacitance of one or more capacitive elements of the force-sensing structure 1051. While the force-sensing structure 1051 is formed as a continuous structure, there may be multiple sensing elements (e.g., capacitive plates) that are disposed within the structure at different locations, and which may be configured to detect deflection or compression of the structure over a portion of entire area of the force-sensing structure 1051. In some embodiments, the force-sensing structure 1051 may also function as a seal or gasket to prevent ingress of moisture or other foreign contaminants into the main cavity of the housing. Additionally, the force-sensing structure 1051 may be integrated with one or more sealing or adhesive layers that also function as a barrier for foreign contaminants.

[0174] As mentioned previously, the force sensor may additionally or alternatively include a strain-based sensing configuration. The strain-based sensing configuration may include, for example, a charge-based or resistive sensor configuration. FIG. 11 depicts a cross-sectional view of a device having an example force sensor 1100 that uses one or more force-sensitive films to detect and measure the force of a touch on a surface 1111 of the cover 609. In this example, the force sensitive film 1102 and 1104 are formed from a transparent material and are disposed relative to a viewable portion of the display 120. As shown in FIG. 11, the force sensor 1100 includes a first force-sensitive film 1102 and a second force-sensitive film 1104 that are separated by one or more intermediate layers 1106. The force-sensitive films 1102, 1104 may be configured to produce different electrical outputs in response to a strain or deflection of the cover 609. In some cases, the intermediate layer 1106 is compressible to allow the first force-sensitive film 1102 to deflect with respect to the second force-sensitive film 1104. In other cases, the intermediate layer 1106 may not be compressible and the first force-sensitive film 1102 deflects in a predictable manner with respect to the second force-sensitive film 1104. While FIG. 11 depicts an example force sensor 1100 having two force-sensitive films, alternative embodiments may include only a single force-sensitive film or, alternatively, include more than two force-sensitive films.

[0175] In general, a transparent force-sensitive film may include a compliant material that exhibits an electrical property that is variable in response to deformation or deflection of the film. The transparent force-sensitive film may be formed from a piezoelectric, piezo-resistive, resistive, or other strain-sensitive materials. Transparent resistive films can be formed by coating a substrate with a transparent conductive material. Potential transparent conductive materials include, for example, polyethyleneioxythiophene (PEDOT), indium tin oxide (ITO), carbon nanotubes, graphene, silver nanowire, other metallic nanowires, and the like. Potential substrate materials include, for example, glass or transparent polymers like polyethylene terephthalate (PET) or cyclo-olefin polymer (COP). Typically, when a piezo-resistive or resistive film is strained, the resistance of the film changes as a function of the strain. The resistance can be measured with an electrical circuit. In this way, a transparent piezo-resistive or resistive film can be used in a similar fashion as a strain gauge.

[0176] If transparency is not required, then other film materials may be used, including, for example, Constantan and Karma alloys for the conductive film and a polyimide may be used as a substrate. Nontransparent applications include force sensing on track pads or the back of display elements. In general, transparent and non-transparent force-sensitive films may be referred to herein as "force-sensitive films" or simply "films."

[0177] In some embodiments, the force-sensitive film is patterned into an array of lines, pixels, or other geometric elements herein referred to as film elements. The regions of the force-sensitive film or the film elements may also be connected to sense circuitry using electrically conductive traces or electrodes. FIG. 12 depicts a cross-sectional view a device having a strain-based force sensor 1200 formed from one or more strain pixel elements 1202 and 1204 separated by intermediate layer 1206. Each of the pixel elements 1202, 1204 may be separated by a gap 1210. In the present example, each pixel element 1202, 1204 may exhibit a measurable change in an electrical property in response to a force being applied to the device. By way of example, as a force is applied to a surface 1211 on the cover 609, one or more of the pixel elements 1202, 1204 is deflected or deformed. Sense circuitry, which is in electrical communication with the one or more pixel elements 1202, 1204, may be configured to detect and measure the change in the electrical property of the film due to the deflection. Based on the measured electrical property of the pixel elements 1202, 1204, an estimated amount of force can be computed. In some cases, the estimated force may represent the magnitude of a touch on the surface 1211 of the device, and be used as an input to a graphical user interface or other element of the device. Additionally, in some embodiments, the relative strain of the individual pixel elements may be compared to estimate a location of the touch. While FIG. 12 depicts an example force sensor 1200 having two layers of pixel elements, alternative embodiments may include only a single layer of pixel elements or, alternatively, include more than two layers of pixel elements.

[0178] The pixel elements 1202, 1204 may be specifically configured to detect strain along one or more directions. In some cases, each pixel element 1202, 1204 includes an array of traces generally oriented along one direction. This configuration may be referred to as a piezo-resistive or resistive strain gauge configuration. In general, in this configuration the force-sensitive-film is a material whose resistance changes in response to strain. The change in resistance may be due to a change in the geometry resulting from the applied strain. For example, an increase in length

combined with decrease in cross-sectional area may occur in accordance with Poisson's effect. The change in resistance may also be due to a change in the inherent resistivity of the material due to the applied strain. For example, the applied strain may make it easier or harder for electrons to transition through the material. The overall effect is for the total resistance to change with strain due to the applied force.

[0179] Further, in a piezo-resistive or resistive strain gauge configuration, each pixel may be formed from a pattern of the force-sensitive-film, aligned to respond to strain along a particular axis. For example, if strain along an x-axis is to be measured, the pixel should have a majority of its trace length aligned with the x-axis. By way of example, FIG. 13A depicts a pixel element 1302 having traces that are generally oriented along the x-axis and may be configured to produce a strain response that is substantially isolated to strain in the x-direction. Similarly, FIG. 13B depicts a pixel element 1304 having traces that are generally oriented along the y-axis and may be configured to produce a strain response that is substantially isolated to strain in the y-direction.

[0180] In some embodiments, the force-sensitive film may be formed from a solid sheet of material and is in electrical communication with a pattern of electrodes disposed on one or more surfaces of the force-sensitive film. The electrodes may be used, for example, to electrically connect a region of the solid sheet of material to sense circuitry. This configuration may be referred to as a piezo-strain configuration. In this configuration, the force-sensitive film may generate a charge when strained. The force-sensitive film may also generate different amounts of charge depending on the degree of the strain. In some cases, the overall total charge is a superposition of the charge generated due to strain along various axes.

[0181] As mentioned previously, a force sensor may be combined with a touch sensor that is configured to detect and measure the location of a touch on the surface of the device. FIG. 14A depicts a simplified schematic representation of an example mutual capacitance touch sensor. As shown in FIG. 14A, a touch sensor 1430 may be formed by an array of nodes 1402 formed at the intersection of an array of drive lines 1404 and sense lines 1406. In this example, stray capacitance C_{stray} may be present at each node 1402 (although FIG. 14A depicts only one C_{stray} for one column for purposes of simplifying the figure). In the example of FIG. 14A, AC stimuli

V_{stim} 1414, V_{stim} 1415 and V_{stim} 1417 can be at different frequencies and phases. Each stimulation signal on a row can cause a charge $Q_{sig}=C_{sig}\times V_{stim}$ to be injected into the columns through the mutual capacitance present at the affected nodes 1402. A change in the injected charge (Q_{sig_sense}) can be detected when a finger, palm or other object is present at one or more of the affected nodes 1402. V_{stim} signals 1414, 1415 and 1417 can include one or more bursts of sine waves. Note that although FIG. 14A illustrates rows 1404 and columns 1406 as being substantially perpendicular, they need not be aligned, as described above. Each column 1406 may be operatively coupled to a receive channel of a charge-monitoring circuit.

[0182] FIG. 14B depicts a side view of an exemplary node in a steady-state (no touch) condition according to examples of the disclosure. In FIG. 14B, electric field lines 1408 between a column 1406 and a row 1404 separated by dielectric 1410 is shown at node 1402.

[0183] FIG. 14C depicts a side view of an exemplary pixel in a dynamic (touch) condition. An object such as finger 1412 can be placed near node 1402. Finger 1412 can be a low-impedance object at signal frequencies, and can have an AC capacitance C_{finger} from the column trace 1406 to the body. The body can have a self-capacitance to ground C_{body} of about 200 pF, where C_{body} can be much larger than C_{finger} . If finger 1412 blocks some electric field lines 1408 between row and column electrodes (those fringing fields that exit the dielectric 1410 and pass through the air above the row electrode), those electric field lines can be shunted to ground through the capacitance path inherent in the finger and the body, and as a result, the steady state signal capacitance C_{sig} can be reduced by DC_{sig} . In other words, the combined body and finger capacitance can act to reduce C_{sig} by an amount DC_{sig} (which can also be referred to herein as C_{sig_sense}), and can act as a shunt or dynamic return path to ground, blocking some of the electric field lines as resulting in a reduced net signal capacitance. The signal capacitance at the pixel becomes $C_{sig}-DC_{sig}$, where DC_{sig} represents the dynamic (touch) component. Note that $C_{sig}-DC_{sig}$ may always be nonzero due to the inability of a finger, palm or other object to block all electric fields, especially those electric fields that remain entirely within the dielectric material. In addition, it should be understood that as finger 1412 is pushed harder or more completely onto the touch sensor, finger 1412 can tend to flatten, blocking more and more of the electric fields lines 1408, and thus DC_{sig} may be variable and representative of how completely finger 1412 is pushing down on the panel (i.e., a range from “no-touch” to “full-touch”).

[0184] Additionally or alternatively, the touch sensor may be formed from an array of self-capacitive pixels or electrodes. FIG. 15A depicts an example touch sensor circuit corresponding to a self-capacitance touch pixel electrode and sensing circuit. Touch sensor circuit 1509 can have a touch pixel electrode 1502 with an inherent self-capacitance to ground associated with it, and also an additional self-capacitance to ground that can be formed when an object, such as finger 1512, is in proximity to or touching the touch pixel electrode 1502. The total self-capacitance to ground of touch pixel electrode 1502 can be illustrated as capacitance 1504. Touch pixel electrode 1502 can be coupled to sensing circuit 1514. Sensing circuit 1514 can include an operational amplifier 1508, feedback resistor 1516, feedback capacitor 1510 and an input voltage source 1506, although other configurations can be employed. For example, feedback resistor 1516 can be replaced by a switch capacitor resistor. Touch pixel electrode 1502 can be coupled to the inverting input of operational amplifier 1508. An AC input voltage source 1506 can be coupled to the non-inverting input of operational amplifier 1508. Touch sensor circuit 1509 can be configured to sense changes in the total self-capacitance 1504 of touch pixel electrode 1502 induced by finger 1512 either touching or in proximity to the touch sensor panel. Output 1520 can be used by a processor to determine a presence of a proximity or touch event, or the output can be inputted into a discrete logic network to determine the presence of a touch or proximity event.

[0185] FIG. 15B depicts an example self-capacitance touch sensor 1530. Touch sensor 1530 can include a plurality of touch pixel electrodes 1502 disposed on a surface and coupled to sense channels in a touch controller, can be driven by stimulation signals from the sense channels through drive/sense interface 1525, and can be sensed by the sense channels through the drive/sense interface 1525 as well. After touch controller has determined an amount of touch detected at each touch pixel electrode 1502, the pattern of touch pixels in the touch screen panel at which touch occurred can be thought of as an “image” of touch (e.g., a pattern of fingers touching the touch screen). The arrangement of the touch pixel electrodes 1502 in FIG. 15B is provided as one example; however, the arrangement and/or the geometry of the touch pixel electrodes may vary depending on the embodiment.

[0186] As previously mentioned, a force sensor may be implemented alone or in combination with another type of touch sensor to sense both touch force and touch location, which may

enable more sophisticated user touch input than using touch location alone. For example, a user may manipulate a computer-generated object on a display using a first type of interaction using a relatively light touch force at a given touch location. The user may also interact with the object using a second type of interaction by using a relatively heavy or sharper touch force at the given location. As one specific example, a user may manipulate or move a computer-generated object, such as a window, using a relatively light touch force. Additionally or alternatively, the user may also select or invoke a command associated with the window using a relatively heavy or sharper touch force. In some cases, multiple types of interactions may be associated with multiple amounts of touch force.

[0187] Additionally, it may be advantageous for the user to be able to provide an analog input using a varying amount of force. A variable, non-binary input may be useful for selecting within a range of input values. The amount of force may, in some cases, be used to accelerate a scrolling operation, a zooming operation, or other graphical user interface operation. It may also be advantageous to use the touch force in a multi-touch sensing environment. In one example, the force of a touch may be used to interpret a complex user input performed using multiple touches, each touch having a different magnitude or degree of force. As a specific but non-limiting example, touch and force may be used in a multi-touch application that allows the user to play a varying tone or simple musical instrument using the surface of the device. In such a housing, the force of each touch may be used to interpret a user's interaction with the buttons or keys of a virtual instrument. Similarly, the force of multiple touches can be used to interpret a user's multiple touches in a game application that may accept multiple non-binary inputs at different locations.

4. Sensor or Biosensor Module

[0188] As described above with respect to FIG. 2, a wearable electronic device may include one or more sensors that can be used to calculate a health metric or other health-related information. For the purposes of the following description of the biosensor module, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100 including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0189] In some embodiments, a wearable electronic device may function as a wearable health assistant that provides health-related information (whether real-time or not) to the user, authorized third parties, and/or an associated monitoring device. The wearable health assistant may be configured to provide health-related information or data such as, but not limited to, heart rate data, blood pressure data, temperature data, blood oxygen saturation level data, diet/nutrition information, medical reminders, health-related tips or information, or other health-related data. The associated monitoring device may be, for example, a tablet computing device, phone, personal digital assistant, computer, and the like.

[0190] In accordance with some embodiments, the electronic device can be configured in the form of a wearable electronic device that is configured or configurable to provide a wide range of functionality. As described above with respect to FIG. 2, the wearable electronic device 100 may include a processing units 102 coupled with or in communication with a memory 104, one or more communications channels 108, output devices such as a display 120 and speaker 122, one or more input components 106, and other modules or components. An example wearable electronic device 100 may be configured to provide or calculate information regarding time, health information, biostatistics, and/or status to externally connected or communicating devices and/or software executing on such devices. The device 100 may also be configured to send and receive messages, video, operating commands, and other communications.

[0191] With reference to FIG. 16, an example device 100 may include various sensors for measuring and collecting data that may be used to calculate a health metric or other health-related information. As one example, the wearable communication device can include an array of light sources 1611-1613 and a detector 1614 that are configured to function as an optical sensor or sensors. In one example, an optical sensor or sensors may implemented as a pairing of one or more light sources 1611-1613 and the detector 1614. In one example implementation, the detector 1614 is configured to collect light and convert the collected light into an electrical sensor signal that corresponds to the amount of light incident on a surface of the detector 1614. In one embodiment, the detector may be a photodetector, such as a photodiode. In other embodiments, the detector 1614 may include a phototube, photosensor, or other light-sensitive device.

[0192] In some cases, the one or more optical sensors may operate as a photoplethysmography (PPG) sensor or sensors. In some instances, a PPG sensor is configured to measure light and produce a sensor signal that can be used to estimate changes in the volume of a part of a user's body. In general, as light from the one or more light sources passes through the user's skin and into the underlying tissue, some light is reflected, some is scattered, and some light is absorbed, depending on what the light encounters. The light that is received by the detector 1614 may be used to generate a sensor signal, which may be used to estimate or compute a health metric or other physiological phenomena.

[0193] The light sources may operate at the same light wavelength range, or the light sources can operate at different light wavelength ranges. As one example, with two light sources, one light source may transmit light in the visible wavelength range while the other light source can emit light in the infrared wavelength range. In some cases, a modulation pattern or sequence may be used to turn the light sources on and off and sample or sense the reflected light. With reference to FIG. 16, the first light source 1611 may include, for example, a green LED, which may be adapted for detecting blood perfusion in the body of the wearer. The second light source 1612 may include, for example, an infrared LED, which may be adapted to detect changes in water content or other properties of the body. The third 1613 light source may be a similar type or different types of LED element, depending on the sensing configuration.

[0194] The optical (e.g., PPG) sensor or sensors may be used to compute various health metrics, including, without limitation, a heart rate, a respiration rate, blood oxygenation level, a blood volume estimate, blood pressure, or a combination thereof. In some instances, blood may absorb light more than surrounding tissue, so less reflected light will be sensed by the detector of the PPG sensor when more blood is present. The user's blood volume increases and decreases with each heartbeat. Thus, in some cases, a PPG sensor may be configured to detect changes in blood volume based on the reflected light, and one or more physiological parameters of the user may be determined by analyzing the reflected light. Example physiological parameters include, but are not limited to, heart rate, respiration rate, blood hydration, oxygen saturation, blood pressure, perfusion, and others.

[0195] While FIG. 16 depicts one example embodiment, the number of light sources and/or detectors may vary in different embodiments. For example, another embodiment may use more than one detector. Another embodiment may also use fewer or more light sources than are depicted in the example of FIG. 16. In particular, in the example depicted in FIG. 16, the detector 1614 is shared between multiple light sources 1611-1613. In one alternative embodiment, two detectors may be paired with two corresponding light sources to form two optical sensors. The two sensors (light source/detector pairs) may be operated in tandem and used to improve the reliability of the sensing operation. For example, output of the two detectors may be used to detect a pulse wave of fluid (e.g., blood) as it passes beneath the respective detectors. Having two sensor readings taken at different locations along the pulse wave may allow the device to compensate for noise created by, for example, movement of the user, stray light, and other effects.

[0196] In some implementation, one or more of the light sources 1611-1613 and the detector 1614 may also be used for optical data transfer with a base or other device. For example, the detector 1614 may be configured to detect light produced by an external mating device, which may be interpreted or translated into a digital signal. Similarly, one or more of the light sources 1611-1613 may be configured to transmit light that may be interpreted or translated into a digital signal by an external device.

[0197] Returning to FIG. 16, the device 100 may also include one or more electrodes to measure electrical properties of the user's body. In this example, a first electrode 1601 and second electrode 1602 are disposed on the rear face of the device 100. The first 1601 and second 1602 electrodes may be configured to make contact with the skin of the user's wrist when the device is being worn. As shown in FIG. 16, a third electrode 1603 and fourth electrode 1604 may be disposed along a periphery of the device body 610. In the configuration of FIG. 16, the third 1603 and fourth 1604 electrodes are configured to come into contact with the skin of the user's other hand (that is not wearing the device 100). For example, the third 1603 and fourth 1604 electrodes may be contacted when the user pinches the device 100 between two digits (e.g., a forefinger and thumb).

[0198] FIG. 16 depicts one example arrangement of electrodes. However, in other embodiments, one or more of the electrodes may be placed in locations that are different than the configuration of FIG. 16. For example, one or more electrodes may be placed on a top surface or other surface of the device 100. Additionally, fewer electrodes or more electrodes may be used to contact the user's skin, depending on the configuration.

[0199] Using the electrodes of the device, various electrical measurements may be taken, which may be used to compute a health metric or other health-related information. By way of example, the electrodes may be used to detect electrical activity of the user's body. In some cases, the electrodes may be configured to detect electrical activity produced by the heart of the user to measure heart function or produce an electrocardiograph (ECG). As another example, the electrodes of the device may be used to detect and measure conductance of the body. In some cases, the measured conductance may be used to compute a galvanic skin response (GSR), which may be indicative of the user's emotional state or other physiological condition. By way of further example, the electrodes may also be configured to measure other health characteristics, including, for example, a body fat estimate, body or blood hydration, and blood pressure.

[0200] In some embodiments, the optical sensors and electrodes discussed above with respect to FIG. 16 may be operatively coupled to sensing circuitry and the processing units 102 to define a health monitoring system. In this capacity, the processing units 102 may be any suitable type of processing device. In one embodiment, the processing units 102 include a digital signal processor. The processing units 102 may receive signals from the optical sensor(s) and/or electrodes and process the signals to correlate the signal values with a physiological parameter of the user. As one example, the processing units 102 can apply one or more demodulation operations to the signals received from the optical sensor. Additionally, the processing units 102 may control the modulation (i.e., turning on and off) of the light sources according to a given modulation pattern or sequence. The processing units 102 may also be used to calculate one or more biometrics or other health related information.

[0201] In some implementations, the wearable electronic device may also receive sensor data or output from an external device. For example, an external mobile device having a global positioning system (GPS) may relay location information to the wearable device, which may be

used to calibrate an activity metric, such as a pedometer or distance calculator. Similarly, sensor output of the wearable electronic device may be transmitted to an external device to compute health-related information. For example, output from an accelerometer in the wearable electronic device may be used determine a body position or gesture, which may be relayed to an external device and used to compute health-related information, such as activity level.

[0202] In some embodiments, some or all of the biosensors may be integrated into a module that is separate from and attached to the housing 601 of the device 100. As described above with respect to FIG. 6, in some embodiments, the biosensors are disposed relative to or attached to a rear cover 608 that is formed from an optically transparent material and is configured to be positioned with the opening of the housing 601. In some embodiments, the rear cover 608 is disposed completely within the area of the cover so that the two components completely overlap when viewed from above. In some embodiments, the rear cover 608 has an edge that protrudes outwardly from the back surface of the housing 601. In some embodiments, an edge of the rear cover 608 extends past a flat portion of the back surface of the housing 601. The rear cover 608 may also have a convex, curved outer contour. The rear cover 608 may have a convex shape that is located within the center and surrounded by the edges of the rear cover 608. The convex curved area of the rear cover 608 may include one or more windows or apertures that provide operational access to one or more internal components located within the housing. For example, the rear cover 608 may include an array of windows, each window including an aperture or opening for a respective light source 1611-1613 and/or the detector 1614. In some embodiments, the windows have a curvature that matches the curvature of the convex curved area of the rear cover 608. In some embodiments, rear cover 608 includes a chamfered edge and a curved bottom surface, the windows being disposed within the curved surface. In some embodiments, two openings of the rear cover 608 are located along a first axis (e.g., an x-axis) and two openings are located along a second axis (e.g., a y-axis) that is transverse to the first axis.

5. Example Wireless Communications with External Devices

[0203] A wearable electronic device may include a functionality for performing wireless communications with an external device. For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs.

2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0204] In some embodiments, the wireless communications are performed in accordance with a Near Field Communications (NFC) protocol. The communication may include an identification protocol and a secured data connection that can be used to identify the user, authorize activity, perform transactions, or conduct other aspects of electronic commerce.

[0205] FIG. 17 depicts an example system 1700 including a device 100 that is located proximate to a station 1710. The station 1710 may include a variety of devices, including, without limitation, a payment kiosk, a vending machine, a security access point, a terminal device, or other similar device. In some cases, the station 1710 is incorporated into a larger system or device. For example, the station 1710 may be incorporated into a security gate of a building or a payment center for a vending system.

[0206] As shown in FIG. 17, the device 100 is a wearable electronic device that may be placed proximate to the station 1710. In this example, a second device 1720 is carried by a user, and may also be placed proximate to the station 1710. In some embodiments, the device 100 and/or the second device 1720 includes a radio-frequency identification (RFID) system that is configured to enable one-way or two-way radio-frequency (RF) communications with the station 1710. The one- or two-way communication may include an identification of the device 100 and the station 1710 to initiate a secured data connection between the two devices. The secured data connection may be used to authorize a transaction between the user and an entity that is associated with the station 1710.

[0207] In some embodiments, the user may initiate a communication with the station 1710 by placing the device 100 near an active region on the station 1710. In some implementations, the station 1710 is configured to automatically detect the presence of the device 100 and initiate an identification process or routine. The RFID system of the device may include a unique identifier or signature that may be used to authenticate the identity of the user. As previously mentioned, the identification process or routine may be used to establish a secure data connection between the device 100 and the station 1710. The secure data connection may be used to authorize a purchase or download of data to or from the device 100. In some cases, the secure data

connection may be used to authorize the transfer of funds from a credit card or financial institution in exchange for a product that is associated with the station 1710. Other transactions or forms of electronic commerce may also be performed using the wireless communication between the device 100 and the station 1710.

6. Example Wireless Power System

[0208] As discussed above, a wearable electronic device may include an internal battery that is rechargeable using an external power source. For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0209] One challenge associated with small devices is that it may be difficult to incorporate an electrical port for coupling the device to an external power source. Because wearable electronic devices have limited space for an external connector, it may be advantageous to electrically couple to a device without a cable or external connector. In at least some embodiments, the wearable electronic device described herein may be configured to operate as a receiver in a wireless power transfer system.

[0210] A wireless power transfer system, one example of which is an inductive power transfer system, typically includes a power-transmitting structure to transmit power and a power-receiving structure to receive power. In some examples, a power-receiving electronic device includes or otherwise incorporates an inductive power-receiving element configured to receive wireless power and/or charge one or more internal batteries. Similarly, a charging device may include or otherwise incorporate an inductive power-transmitting element configured to wirelessly transmit power to the power-receiving electronic device. The charging device may be configured as a base or dock on which the power-receiving electronic device rests or to which it physically connects in some embodiments. In other embodiments, the charging device may be proximate the electronic device but not necessarily touching or physically coupled.

[0211] In many examples, the battery-powered electronic device may be positioned on an external surface of the power-transmitting device, otherwise referred to as a dock. In these

systems, an electromagnetic coil within the dock (e.g., transmit coil) may produce a time-varying electromagnetic flux to induce a current within an electromagnetic coil within the electronic device (e.g., receive coil). In many examples, the transmit coil may transmit power at a selected frequency or band of frequencies. In one example the transmit frequency is substantially fixed, although this is not required. For example, the transmit frequency may be adjusted to improve inductive power transfer efficiency for particular operational conditions. More particularly, a high transmit frequency may be selected if more power is required by the electronic device and a low transmit frequency may be selected if less power is required by the electronic device. In other examples, a transmit coil may produce a static electromagnetic field and may physically move, shift, or otherwise change its position to produce a spatially-varying electromagnetic flux to induce a current within the receive coil.

[0212] The electronic device may use the received current to replenish the charge of a rechargeable battery or to provide power to operating components associated with the electronic device. Thus, when the electronic device is positioned on the dock, the dock may wirelessly transmit power at a particular frequency via the transmit coil to the receive coil of the electronic device.

[0213] A transmit coil and receive coil may be disposed respectively within housings of the dock and electronic device so as to align along a mutual axis when the electronic device is placed on the dock. If misaligned, the power transfer efficiency between the transmit coil and the receive coil may decrease as misalignment increases. Accordingly, in many examples, the wireless power transfer system may include one or more alignment assistance features to effect alignment of the transmit and receive coils along the mutual axis.

[0214] FIG. 18 depicts a front perspective view of an example wireless power transfer system 1800 in an unmated configuration. The illustrated embodiment shows an inductive power transmitter dock 1802 that is configured to couple to and wirelessly transmit power to an inductive power receiver accessory, in this case device 100. The wireless power transfer system 1800 may include one or more alignment assistance features to effect alignment of the device 100 with the dock 1802 along a mutual axis. For example, the housings of the dock 1802 and the device 100 may assist with alignment. In one implementation, a portion of the housing of the

device 100 may engage and/or interlock with a portion of the housing of the dock 1802 in order to effect the desired alignment. In some embodiments, a bottom portion of the device 100 may be substantially convex and a top surface of the dock 1802 may be substantially concave. In other examples, the interfacing surfaces of the dock 1802 and the device 100 may be substantially flat, or may include one or more additional housing features to assist with effecting mutual alignment.

[0215] In some embodiments, one or more actuators in the dock 1802 and/or device 100 can be used to align the transmitter and receiver devices. In yet another example, alignment assistance features, such as protrusions and corresponding indentations in the housings of the transmitter and receiver devices, may be used to align the transmitter and receiver devices. The design or configuration of the interface surfaces, one or more alignment assistance mechanisms, and one or more alignment features can be used individually or in various combinations thereof.

[0216] Alignment assistance can also be provided with one or more magnetic field sources. For example, a permanent magnet within the dock 1802 may attract a permanent magnet within the device 100. In another example, a permanent magnet within the device 100 may be attracted by a magnetic field produced by the dock 1802. In further examples, multiple alignment assistance features may cooperate to effect alignment of the transmit and receive coils. Power transfer efficiency may also decrease if the power consumption of the electronic device changes (e.g., the electronic device transitions from a trickle charge mode to constant current charge mode) during wireless power transfer.

[0217] As discussed previously with respect to FIG. 2, the device 100 may include a processor coupled with or in communication with a memory, one or more communication interfaces, output devices such as displays and speakers, and one or more input devices such as buttons, dials, microphones, or touch-based interfaces. The communication interface(s) can provide electronic communications between the communications device and any external communication network, device or platform, such as, but not limited to, wireless interfaces, Bluetooth interfaces, Near Field Communication interfaces, infrared interfaces, USB interfaces, Wi-Fi interfaces, TCP/IP interfaces, network communications interfaces, or any conventional communication interfaces. The device 100 may provide information regarding time, health, statuses or

externally connected or communicating devices and/or software executing on such devices, messages, video, operating commands, and so forth (and may receive any of the foregoing from an external device), in addition to communications.

[0218] In the example depicted in FIG. 18, the dock 1802 may be connected to an external power source, such as an alternating current power outlet, by power cord 1808. In other embodiments, the dock 1802 may be battery operated. In still further examples, the dock 1802 may include a power cord 1808 in addition to an internal or external battery. Similarly, although the embodiment is shown with the power cord 1808 coupled to the housing of the dock 1802, the power cord 1808 may be connected by any suitable means. For example, the power cord 1808 may be removable and may include a connector that is sized to fit within an aperture or receptacle opened within the housing of the dock 1802.

[0219] Although the device 100 is shown in FIG. 18 as larger than the dock 1802, the depicted scale may not be representative of all embodiments. For example, in some embodiments the dock 1802 may be larger than the device 100. In still further embodiments the two may be substantially the same size and shape. In other embodiments, the dock 1802 and device 100 may take separate shapes.

[0220] FIG. 19 depicts a simplified block diagram of relevant aspects of the device 100 and dock 1802. It may be appreciated that certain components of both the dock 1802 and device 100 are omitted from the figure for clarity. Likewise, the positions of the elements that are shown are meant to be illustrative rather than necessarily portraying a particular size, shape, scale, position, orientation, or relation to one another, although some embodiments may have elements with one or more of such factors as illustrated.

[0221] As described previously with respect to FIG. 2, the device 100 may include one or more electronic components located within the housing 601. For clarity, some of the components and modules described or depicted in various embodiments are omitted from the depiction of FIG. 19. As shown in FIG. 19, the device 100 may include an internal battery 114 that may be used to provide power to the various internal components of the device 100. As described previously, the internal battery 114 may be rechargeable by an external power supply. In the present

example, the internal battery 114 is operably connected to a receive coil 1869 via power conditioning circuit 1810.

[0222] In the present example, the device 100 includes a receive coil 1869 having one or more windings for inductively coupling with a transmit coil 1832 of the dock 1802. The receive coil 1869 may receive power wirelessly from the dock 1802 and may pass the received power to a battery 114 within the device 100 via power conditioning circuit 1810. The power conditioning circuit 1810 may be configured to convert the alternating current received by the receive coil 1869 into direct current power for use by other components of the device. In one example, the processing units 102 may direct the power, via one or more routing circuits, to perform or coordinate one or more functions of the device 100 typically powered by the battery 114.

[0223] As shown in FIG. 19, the dock 1802 includes a transmit coil 1832 having one or more windings. The transmit coil 1832 may transmit power to the device 100 via electromagnetic induction or magnetic resonance. In many embodiments, the transmit coil 1832 may be shielded with a shield element that may be disposed or formed around portions of the transmit coil 1832. Similarly, the receive coil 1869 may also include a shield element that may be disposed or formed around a portion of the receive coil 1869.

[0224] As shown in FIG. 19, the dock 1802 also includes a processor 1834 that may be used to control the operation of or coordinate one or more functions of the dock 1802. In some embodiments, the dock 1802 may also include one or more sensors 1836 to determine whether the device 100 is present and ready to receive transmitted power from the dock 1802. For example, the dock 1802 may include an optical sensor, such as an infrared proximity sensor. When the device 100 is placed on the dock 1802, the infrared proximity sensor may produce a signal that the processor 1834 uses to determine the presence of the device 100. The processor 1834 may, optionally, use another method or structure to verify the presence of the electronic device via sensor 1836. Examples of different sensors that may be suitable to detect or verify the presence of device 100 may include a mass sensor, a mechanical interlock, switch, button or the like, a Hall effect sensor, or other electronic sensor. Continuing the example, after the optical sensor reports that the device 100 may be present, the processor 1834 may activate a communication channel to attempt to communicate with the device 100.

[0225] As illustrated in FIG. 19, a bottom surface of the housing of the device 100 may partially contact a top surface of the dock housing. In some implementations, the interfacing surfaces of the device 100 and the dock 1802 may be formed with complementary geometries. For example, as depicted in FIG. 19, the bottom surface of the device 100 is convex and the top surface of the dock 1802 is concave, following the same curvature as the bottom surface of the device 100. In this manner, the complementary geometries may facilitate alignment of the electronic device and dock for efficient wireless power transfer.

[0226] In some embodiments, the dock 1802 and device 100 may include other alignment assistance features. For example the device 100 may include an alignment magnet 1838 which is positioned and oriented to attract a corresponding alignment magnet 1840 within the dock 1802. In some cases, when the device 100 is positioned proximate the dock 1802, the alignment magnets 1838, 1840 may be mutually attracted, thereby affecting alignment of the portable electronic device 100 and the dock 1802 along a mutual axis. In other examples, the dock 1802 may include a ferromagnetic material in place of the alignment magnet 1840. In these examples, the alignment magnet 1838 may be attracted to the ferromagnetic material. In still further cases, the receive coil 1869 or transmit coil 1832 may produce a static magnetic field that either attracts or repels either or both of the alignment magnets 1838, 1840.

[0227] As shown in FIG. 19, the alignment magnets 1838, 1840 may be positioned within a respective coil 1869, 1832. When the alignment magnets 1838, 1840 are drawn together, the coils 1869, 1832 may be placed into alignment. Additionally, the complementary geometries of the device 100 and the dock 1802 may further facilitate alignment when the alignment magnets 1838, 1840 are drawn together.

7. Example Acoustic Module

[0228] As described above, the device may include one or more devices for transmitting and receiving acoustic energy. For the purposes of the following description of the acoustic module, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above. As previously discussed, in some embodiments, the device may include a speaker for transmitting acoustic

energy and/or a microphone for receiving acoustic energy. For the purposes of the following description, a speaker device and a microphone are referred to generically as an acoustic module, which may be configured to transmit and/or receive acoustic energy depending on the particular implementation.

[0229] FIG. 20 depicts a simplified schematic cross-sectional view of a first embodiment of a device having an acoustic module 2006. The representation depicted in FIG. 20 is not drawn to scale and may omit some elements for clarity. The acoustic module 2006 may represent either a portion of a speaker and/or microphone device described above with respect to the electronic device 100 of FIG. 2.

[0230] As shown in FIG. 20, an acoustic port 2020 may be formed in the housing 601 of the electronic device. In the present example, the acoustic port 2020 includes first and second orifices 2031, 2032 that are formed in the housing 601 and acoustically couple the acoustic cavity 2011 of the acoustic module 2006 to the external environment (external to the electronic device). In the present embodiment, the first and second orifices 2031, 2032 are offset with respect to the opening of the acoustic cavity 2011. This configuration may help reduce the direct ingress of liquid 2001 into acoustic cavity 2011 of the acoustic module 2006. Also, as shown in FIG. 20 a shield 2021 or umbrella structure that is formed between the orifices 2031, 2032 blocks the direct ingress of liquid 2001 into the acoustic cavity 2011. As shown in FIG. 20, the acoustic module 2006 also includes a screen element 2015 disposed at one end of the acoustic cavity 2011, which may also prevent the ingress of liquid or other foreign debris into the acoustic cavity 2011. The acoustic module 2006 also includes a seal 2016 disposed between the housing 601 and the connector element 2012 of the module, which may also be configured to prevent the ingress of water into the device and/or module.

[0231] In the present example depicted in FIG. 20, the acoustic module 2006 may correspond to the speaker 122 described with respect to some embodiments. As shown in FIG. 20, the acoustic module 2006 includes various components for producing and transmitting sound, including a diaphragm 2010, a voice coil 2009, a center magnet 2008, and side magnets/coils 2007. These components may cooperate to form a speaker acoustic element. In one implementation, the diaphragm 2010 is configured to produce sound waves or an acoustic signal in response to a

stimulus signal in the center magnet 2008. For example, a modulated stimulus signal in the center magnet 2008 causes movement of the voice coil 2009, which is coupled to the diaphragm 2010. Movement of the diaphragm 2010 creates the sound waves, which propagate through the acoustic cavity 2011 of acoustic module 2006 and eventually out the acoustic port 2020 to a region external to the device. In some cases, the acoustic cavity 2011 functions as an acoustical resonator having a shape and size that is configured to amplify and/or dampen sound waves produced by movement of the diaphragm 2010.

[0232] As shown in FIG. 20, the acoustic module 2006 also includes a yoke 2014, support 2013, connector element 2012, and a cavity wall 2017. These elements provide the physical support of the speaker elements. Additionally, the connector element 2012 and the cavity wall 2017 together form at least part of the acoustic cavity 2011. The specific structural configuration of FIG. 20 is not intended to be limiting. For example, in alternative embodiments, the acoustic cavity may be formed from additional components or may be formed from a single component.

[0233] The acoustic module 2006 depicted in FIG. 20 is provided as one example of a type of speaker acoustic module. In other alternative implementations, the acoustic module may include different acoustic elements for producing and transmitting sound, including, for example, a vibrating membrane, piezoelectric transducer, vibrating ribbon, or the like. Additionally, in other alternative implementations, the acoustic module may be a microphone acoustic module having one or more elements for converting acoustic energy into an electrical impulse. For example, the acoustic module may alternatively include a piezoelectric microphone acoustic element for producing a charge in response to acoustic energy or sound.

[0234] As previously mentioned, because the acoustic port 2020 connects the acoustic module 2006 to the external environment, there is a possibility that liquid may accumulate or infiltrate the interior of the module. In some cases, the screen element 2015 or other protective features may not prevent all liquid from entering the acoustic cavity 2011 of the module. For example, if the device is subjected to a liquid under pressure or a directed stream of liquid, some liquid ingress may occur. Additionally, naturally occurring moisture in the air may condense and accumulate over time resulting in the presence of liquid within the module. Thus, in some implementations, the acoustic module 2006 may include one or more elements configured to

expel water or liquid that accumulates in, for example, the acoustic cavity 2011 of the module. The liquid expulsion process may include modifying the charge on a portion of the wall of the acoustic cavity 2011 to change the surface energy of the wall and/or producing an acoustic pulse using the diaphragm 2010 to help expel liquid from the acoustic cavity 2011. In some embodiments, the screen 2015 may also have hydrophilic or hydrophobic properties that may facilitate removal of liquid held within the acoustic cavity 2011.

8. Example Antenna and Cover

[0235] As previously described, a wearable electronic device may be configured to communicate wirelessly with various external devices and communication networks. For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0236] In some embodiments, as previously discussed with respect to FIG. 2, the device may include one or more communication channels that are configured to transmit and receive data and/or signals over a wireless communications network or interface. Example wireless interfaces include radio frequency cellular interfaces, Bluetooth interfaces, Wi-Fi interfaces, or any other known communication interface.

[0237] In some implementations an antenna may be disposed with respect to the cover (e.g., crystal) of a device to facilitate wireless communications with an external device or communication network. In some cases, it may be advantageous to integrate an antenna into the cover to improve the transmission and reception of wireless signals from the device. In particular, the cover of the device may have dielectric properties that facilitate the transmission of radio frequency signals while also protecting the antenna from physical damage or interference. Additionally, if the antenna is integrated into a perimeter portion of the cover, the visual appearance or clarity of the cover may be minimized. Furthermore, the embodiments described below with respect to FIGs. 21A-B may be used to integrate an antenna external to the housing, without increasing the thickness of the device body.

[0238] FIG. 21A depicts a perspective exploded view of a cover 2100 and an antenna assembly 2130. The cover 2100 depicted in FIG. 21A is viewed from an inner surface 2124 that is configured to attach to or interface with the opening of the housing (described above with respect to FIG. 1). As shown in FIG. 21A, a groove 2128 may be formed within the inner surface 2124. In this example, the groove 2128 is formed around the periphery of the cover 2100. As mentioned previously, this may be advantageous in minimizing the visual impact of having the antenna assembly 2130 located within the cover 2100.

[0239] As shown in FIG. 21A the antenna assembly 2130 includes an antenna ring 2134 and a terminal 2140 which may interface with an electrical connector 2150. In the present embodiment, the groove 2128 formed in the surface of the cover 2100 may be configured to accept the antenna ring 2134. In particular, the groove 2128 may receive the entire antenna ring 2134 without a portion of the antenna ring 2134 protruding past the inner surface 2124, when the antenna ring 2134 is installed. In some cases, the groove 2128 is formed to be a clearance or near clearance fit with the diameter of the antenna ring 2134. Thus, in some cases, the antenna ring 2134 may substantially fill the groove 2128 when the ring is installed. In some cases, the groove 2128 may be configured to retain the antenna ring 2134 due to a slight interference fit or due to a feature formed within either the cover 2100 and/or the antenna assembly 2130. In the present embodiment, the antenna assembly 2130 may be installed in the cover 2100 and then connected to other electronics via the terminal 2140 and the connector 2150, which may protrude into an opening in the case or housing.

[0240] FIG. 21B depicts a cross-sectional view of the cover and antenna at the connection point. In particular, FIG. 21B depicts a detail cross-sectional view of the cover 2100 installed within the housing 601 at a region near the terminal 2140. In this example, the cover 2100 is attached to a shelf of the housing 601 via a compressible element 2122. The compressible element 2122 may provide a seal against water or other contaminants and also provide compliance between the cover 2100 and the housing 601. The compressible element 2122 may be formed from a nitrile or silicone rubber and may also include an adhesive or other bonding agent.

[0241] As shown in FIG. 21B, the antenna ring 2134 is disposed entirely within the groove 2128. In this case, the antenna ring 2134 does not protrude past the inner surface 2124. The antenna

ring 2134 is electrically connected to the terminal 2140, which protrudes into an opening in the housing 601. As shown in FIG. 21B, the terminal 2140 includes conductive pads 2142 for electrically connecting to the antenna ring 2134. In this example, spring clips 2152 are configured to mechanically and electrically connect to the conductive pads 2142 on the terminal 2140. One advantage to the configuration depicted in FIG. 21B is that the antenna assembly 2130 may be installed in the cover 2100 before the cover 2100 is installed in the housing 601. The terminal 2140 and connector 2150 facilitate a blind connection that may assist electrical connection as the cover 2100 is installed. Additionally, the configuration depicted in FIG. 21B may allow for some movement between the cover 2100 and the housing 601 without disturbing the electrical connection with the antenna ring 2134.

9. Example Haptic Module

[0242] As described above, the device may include one or more haptic modules for providing haptic feedback to the user. The embodiments described herein may relate to or take the form of durable and thin haptic feedback elements suitable to provide a perceivable single pulse haptic feedback. In general, a haptic device may be configured to produce a mechanical movement or vibration that may be transmitted through the housing and/or other component of the device. In some cases, the movement or vibration may be transmitted to the skin of the user and perceived as a stimulus or haptic feedback by the user. In some implementations, the haptic feedback may be coupled to one or more device outputs to alert the user of an event or activity. For example, a haptic output may be produced in combination with an audio output produced by the speaker, and/or a visual output produced using the display.

[0243] The space constraints associated with a small wrist-worn device may present unique challenges to integrating a haptic mechanism into wearable electronics. In particular, a haptic mechanism may use a moving mass used to create the movement or vibration of the haptic output. The larger the mass that is moved, the easier it may be to create a perceivable stimulus using the haptic mechanism. However, a large moving mass and the supporting mechanism may be difficult to integrate into the compact space of, for example, the housing of a wearable electronic wristwatch.

[0244] Thus, the haptic module implemented in some embodiments may be configured to maximize the mechanical energy that is produced in a very compact form factor. FIGs. 22A-B depict one example haptic mechanism that may be particularly well suited for use in a wearable electronic device. While the embodiment described with respect to FIGs. 22A-B is provided as one example, the haptic module is not limited to this particular configuration.

[0245] FIG. 22A depicts a three-quarters perspective view of a haptic device 112, with a top, front and left sidewall of the housing 2220 removed to expose internal components. FIG. 22B depicts a cross-sectional perspective view of the haptic device 112 cut in half to expose the internal components. In this example, a coil 2200 is used to induce movement of a frame 2260, which houses a central magnet array 2210. As shown in FIGs. 22A-B, the movement of the frame 2260 is guided by a shaft 2250 that is fixed with respect to a housing 2220.

[0246] In the present example, the coil 2200 may be energized by transmitting a current (e.g., from the battery) along a length of a wire that forms the coil 2200. A direction of the current along the wire of the coil 2200 determines a direction of a magnetic field that emanates from the coil 2200. In turn, the direction of the magnetic field determines a direction of movement of the frame 2260 housing the central magnet array 2210. One or more springs may bias the frame 2260 towards the middle region of the travel. In this example, the frame 2260 and central magnet array 2210, through operation of the coil 2200, function as a moving mass, which generates a tap or vibration. The output of the haptic device 112, created by the moving mass of the frame 2260 and central magnet array 2210, may be perceived as a haptic feedback or stimulus to the user wearing the device.

[0247] For example, when the coil 2200 is energized, the coil 2200 may generate a magnetic field. The opposing polarities of the magnets in the magnet array 2210 generates a radial magnetic field that interacts with the magnetic field of the coil 2200. The Lorentz force resulting from the interaction of the magnetic fields causes the frame 2260 to move along the shaft 2250 in a first direction. Reversing current flow through the coil 2200 reverses the Lorentz force. As a result, the magnetic field or force on the central magnet array 2210 is also reversed and the frame 2260 may move in a second direction. Thus, frame 2260 may move in both directions along the shaft 2250, depending on the direction of current flow through the coil 2200.

[0248] As shown in FIG. 22A, the coil 2200 encircles the central magnet array 2210, which is disposed near the center of the frame 2260. As previously described, the coil 2200 may be energized by transmitting a current along the length of the wire forming the coil 2200, and the direction of the current flow determines the direction of the magnetic flux emanating from the coil 2200 in response to the current. Passing an alternating current through the coil 2200 may cause the central magnet array 2210 (and frame 2260) to move back and forth along a shaft 2250. In order to prevent the central magnet array 2210 from being attracted to the shaft 2250, which could increase friction between the two and thereby increase the force necessary to move the central magnet array 2210 and frame 2260, the shaft 2250 may be formed from a non-ferrous material such as tungsten, titanium, stainless steel, or the like.

[0249] As depicted in FIGs. 22A-B, the coil 2200 is positioned within a frame 2260 that holds the central magnet array 2210, but is not affixed to the coil 2200. Rather, an air gap separates the coil 2200 from the central magnet array 2210 and the frame 2260 is free to move with respect to the coil 2200, which is generally stationary. Further, the frame 2260 generally moves with the central magnet array 2210. As illustrated in FIGs. 22A-B, the frame 2260 may have an aperture formed therein of sufficient size to contain the coil 2200. Even when the frame and central magnet array are maximally displaced within the housing 2220 (e.g., to one end or the other of the shaft 2250), the coil 2200 does not contact any portion of the frame 2260. It should be appreciated that the coil 2200 remains stationary in the housing 2220 while the frame 2260 and central magnet array 2210 move, although in other embodiments the coil 2200 may move instead of, or in addition to, the frame and/or central magnet array. However, by keeping the coil 2200 stationary, it may be easier to provide interconnections for the coil, such as between the coil and the flex, and therefore reduce the complexity of manufacture.

[0250] As shown in FIGs. 22A-B, the central magnet array 2210 may be formed from at least two magnets 2211, 2212 of opposing polarities. A center interface 2270 may be formed from a ferrous or non-ferrous material, depending on the embodiment. A ferrous material for the center interface 2270 may enhance the overall magnetic field generated by the central magnet array 2210, while a non-ferrous material may provide at least a portion of a return path for magnetic flux and thus assist in localizing the flux within the housing 2220. In some embodiments, the magnets 2211, 2212 are formed from neodymium while the frame is tungsten. This combination

may provide a strong magnetic field and a dense mass, thereby yielding a high weight per volume structure that may be used as the moving part of the haptic device 112.

10. Example Crown Module

[0251] As described above, the device may include a crown that may be used to accept user input to the device. For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0252] In some embodiments, a crown may be used to accept rotary input from the user, which may be used to control aspects of the device. The crown may be knurled or otherwise textured to improve grip with the user's finger and/or thumb. In some embodiments, a crown may be turned by the user to scroll a display or select from a range of values. In other embodiments, the crown may be rotated to move a cursor or other type of selection mechanism from a first displayed location to a second displayed location in order to select an icon or move the selection mechanism between various icons that are output on the display. In a time keeping application, the crown may also be used to adjust the position of watch hands or index digits displayed on the display of the device. The crown may also be used to control the volume of a speaker, the brightness of the display screen, or control other hardware settings.

[0253] In some embodiments, the crown may also be configured to accept linear, as well as rotary, input. For example, the crown may be configured to translate along an axis when pressed or pulled by the user. In some cases, the linear actuation may be used as additional user input. The actuation may provide a binary output (actuated/not actuated) or may also provide a non-binary output that corresponds to the amount of translation along the axis of motion. In some instances, the linear input to the crown may be combined with the rotary input to control an aspect of the device.

[0254] The embodiments described herein may be used for at least a portion of the crown module integrated into a wearable electronic device. The embodiments are provided as examples and may not include all of the components or elements used in a particular implementation.

Additionally, the crown module is not intended to be limited to the specific examples described below and may vary in some aspects depending on the implementation.

[0255] In some embodiments, an optical encoder may be used to detect the rotational motion of the crown. More specifically, the example provided below with respect to FIG. 23 may use an optical encoder to detect rotational movement, rotational direction and/or rotational speed of a component of the electronic device. Once the rotational movement, rotational direction and/or rotational speed have been determined, this information may be used to output or change information and images that are presented on a display or user interface of the electronic device.

[0256] Integrating an optical encoder into the space constraints of a typical wearable electronic device may be particularly challenging. Specifically, some traditional encoder configurations may be too large or delicate for use in a portable electronic device. The optical encoder described below may provide certain advantages over some traditional encoder configurations and may be particularly well suited for use with a crown module of a wearable electronic device.

[0257] As shown in the example embodiment of FIG. 23, the optical encoder of the present disclosure includes a light source 2370, a photodiode array 2380, and a shaft 2360. However, unlike typical optical encoders, the optical encoder of the present disclosure utilizes an encoding pattern disposed directly on the shaft 2360. For example, the encoding pattern includes a number of light and dark markings or stripes that are axially disposed along the shaft 2360. Each stripe or combination of stripes on the shaft 2360 may be used to identify a position of the shaft 2360. For example, as light is emitted from the light source 2370 and reflected off of the shaft 2360 into the photodiode array 2380, a position, rotation, rotation direction and rotation speed of the shaft 2360 may be determined. Once the rotation direction and speed are determined, this information may be used to output or change information or images that are presented on the display or user interface of the electronic device.

[0258] In other embodiments, the shape or form of the shaft of the encoder may be used to determine a position, rotation, rotation direction and rotation speed of the shaft. For example, the shaft may be fluted or have a number of channels that cause the light to be reflected in a number of different directions. Accordingly, a diffractive pattern may be used to determine the rotation, rotation direction and rotation speed of the shaft.

[0259] FIG. 23 illustrates a simplified depiction of the device 100 and crown module 642 in accordance with some embodiments. As shown in FIG. 23, the crown module 642 may be integrated with the housing 601 of the device 100 and may be formed from a dial 2340 disposed at the end of a shaft 2360. In the present embodiment, the crown module 642 also forms part of the optical encoder. As discussed above, the crown module 642 includes an optical encoder that includes a shaft 2360, a light source 2370, and a photodiode array 2380. Although a photodiode array is specifically mentioned, embodiments disclosed herein may use various types of sensors that are arranged in various configurations for detecting the movement described herein. For example, the movement of the shaft 2360 may be detected by an image sensor, a light sensor such as a CMOS light sensor or imager, a photovoltaic cell or system, photo resistive component, a laser scanner and the like.

[0260] The optical encoder may produce an encoder output that is used to determine positional data of the crown module 642. In particular, the optical encoder may produce an output that is used to detect that movement of the dial 2340 including the direction of the movement, speed of the movement and so on. The movement may be rotational movement, translational movement, angular movement, and so on. The optical encoder may also be used to detect the degree of the change of rotation of the dial 2340 and/or the angle of rotation of the dial 2340 as well as the speed and the direction of the rotation of the dial 2340.

[0261] The signals or output of the optical encoder may be used to control various aspects of other components or modules of the device. For example, continuing with the time keeping application example discussed above, the dial 2340 may be rotated in a clockwise manner in order to advance the displayed time forward. In one implementation, the optical encoder may be used to detect the rotational movement of the dial 2340, the direction of the movement, and the speed at which the dial 2340 is being rotated. Using the output from the optical encoder, the displayed hands of a time keeping application may rotate or otherwise move in accordance with the user-provided rotational input.

[0262] Referring back to FIG. 23, the crown module 642 may be formed from dial 2340 that is coupled to the shaft 2360. In some cases, the shaft 2360 and dial 2340 may be formed as a single piece. As the shaft 2360 is coupled to, or is otherwise a part of the dial 2340, as the dial 2340

rotates or moves in a particular direction and at a particular speed, the shaft 2360 also rotates or moves in the same direction and with the same speed.

[0263] As shown in FIG. 23, the shaft 2360 of the optical encoder includes an encoding pattern 2365. As discussed above, the encoding pattern 2365 may be used to determine positional information about the shaft 2360 including rotational movement, angular displacement and movement speed. As shown in FIG. 23, the encoding pattern 2365 may include a plurality of light and dark stripes.

[0264] Although light stripes and dark stripes are specifically mentioned and shown, the encoding pattern 2365 may consist of various types of stripes having various shades or colors that provide surface contrasts. For example, the encoding pattern 2365 may include a stripe or marking that has a high reflective surface and another stripe that has a low reflective surface regardless of the color or shading of the stripes or markings. In another embodiment, a first stripe of the encoding pattern 2365 may cause specular reflection while a second stripe of the encoding pattern 2365 may cause diffuse reflection. When the reflected light is received by the photodiode array 2380, a determination may be made as to the position and movement of the shaft such as described below. In embodiments where a holographic or diffractive pattern is used, the light from the light source 2370 may diffract from the shaft 2360. Based on the diffracted light, the photodiode array 2380 may determine the position, movement and direction of movement of the shaft 2360.

[0265] In some embodiments, the stripes of the encoding pattern 2365 extend axially along the shaft 2360. The stripes may extend along the entire length of the shaft 2360 or partially along a length of the shaft 2360. In addition, the encoding pattern 2365 may also be disposed around the entire circumference of the shaft 2360. In other embodiments, the encoding pattern 2365 may include a radial component. In yet other embodiments, the encoding pattern 2365 may have both a radial component and an axial component.

[0266] In some embodiments, the crown module may also include a tactile switch for accepting translational input from the user. FIGs. 24A-B depict another example of a crown module 642a having a tactile switch assembly 2410. As shown in FIG. 24A, the tactile switch assembly 2410

may include a dial 2448 (or button), a coupling 2418, a shear plate 2456, and a tactile switch 2414.

[0267] In the embodiment depicted in FIGs. 24A-B, the dial 2448 is translatable and/or rotatable relative to the housing. The ability of the dial 2448 to translate and rotate relative to the housing allows a user to provide a rotational force and/or translating force to the tactile switch assembly. In particular, the dial 2448 of the present example may be operably coupled to or form part of an optical encoder, in accordance with the example described above with respect to FIG. 23.

[0268] In the present example, the dial 2448 includes an outer surface 2432 that is configured to receive a rotary or rotational user input and a stem 2450 that extends from an interior surface 2434 of the dial 2448. The stem 2450 may define a coupling aperture that extends longitudinally along a length or a portion of a length of the stem 2450. In the depicted example, the stem 2450 may be hollow or partially hollow.

[0269] In the example depicted in FIGs. 24A-B, the coupling 2418 may be a linkage, such as a shaft, that couples the dial 2448 to the tactile switch 2414. The coupling 2418 may be integrally formed with the dial 2448 or may be a separate component operably connected thereto. For example, the stem 2450 of the dial 2448 may form the coupling member that is integrally formed with the dial 2448. The coupling 2418 may be made of a conductive material, such as one or more metals or metal alloys. Due to the conductive characteristics, the coupling 2418 may further act to electrically couple the dial 2448 to the tactile switch 2414 and shear plate 2456. In the example depicted in FIGs. 24A-B, the shear plate 2456 is positioned between the coupling 2418 and the tactile switch 2414. In some embodiments, the shear plate 2456 may prevent or reduce shearing forces from the coupling from being transmitted to the tactile switch. The shear plate 2456 also allows transfer of linear force input from the dial 2448 to the switch 2414.

[0270] The configuration depicted in FIGs. 24A-B may be used to accept both rotational and translational input from the user. For example, if a user provides a rotational force to the dial 2448, the coupling 2418 and dial 2448 may rotate in the direction of the force. The coupling 2418 may be attached to or integrated with one or more sensors that are configured to detect rotational movement. For example the coupling 2418 may be integrated with an optical encoder, similar to the example described above with respect to FIG. 23. Additionally, if a user provides

a translational force to the dial 2448, the force may be transmitted through the dial 2448 and coupling 2418 to actuate the switch 2414. In some cases, the switch 2414 includes a metal dome switch that is configured to provide a tactile feedback when actuated. In some cases, the actuation of a dome switch may be perceived by the user as a click or release as the switch 2414 is actuated. Once the force has been removed from the dial 2448, the dome switch resiliently returns to its original position, providing a biasing force against the coupling 2418 to return both the dial 2448 and the coupling 2418 to their original positions. In some embodiments, the tactile switch 2414 may include a separate biasing element, such as a spring, that exerts a force (either directly or indirectly via the shear plate) against the coupling. FIG. 24A depicts the tactile switch assembly 2410 when there is no force applied (un-actuated). FIG. 24B depicts the tactile switch assembly 2410 when there is a translational force applied to the dial 2448 (actuated).

11. Example Band Attachment Mechanism

[0271] For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0272] As described above, a wearable electronic device may include a band that is attached to a device body having one or more receiving features. In particular, the housing may include or form a receiving feature that facilitates an interchange or replacement of different bands that are used to secure the device to the wrist of the user. By replacing or interchanging bands the device may be adapted for multiple uses ranging from sporting activities to professional or social activities.

[0273] In some embodiments, the receiving features are configured to be operated without the use of special tools or fixtures. For example, the bands may be interchanged by hand or with the help of a simple tool, such as a pointed object. Additionally or alternatively, a tool or other component, such as a component of the device to which the attachment system is coupled, may be configured to actuate a button or other component of the attachment system to secure and/or release the band from the device. In one embodiment, the lug portion of a band may be configured to be inserted into an opening or channel portion of the receiving feature. Once the

lug of the band has been inserted into the opening, the lug may slide within the opening of the device until the band is secured or otherwise coupled to the device. The coupling between the band and the receiving feature may provide a secure attachment of the band to the housing or device body. Just as the band is configured to slide into the channel of the receiving feature, the lug may also slide out of the channel of the receiving feature allowing the band to be detached from the device body.

[0274] In one embodiment, the receiving feature includes a locking mechanism, which may be integrated with portions of either the band or the receiving feature. In one example, as the band is inserted into a receiving feature of the device, the locking mechanism interfaces with a portion of the receiving feature to lock or otherwise secure the band within the receiving feature. The locking mechanism may also be configured to interface with a releasing mechanism associated with the receiving feature. For example, a releasing mechanism may be configured to disengage or release the locking mechanism. In some implementations, actuation of the releasing mechanism causes the locking mechanism to be released and allows the band to be removed by sliding within the receiving feature.

[0275] FIG. 25A depicts a receiving feature and band assembly as viewed from the bottom of the device body. As shown in FIG. 25A, a receiving feature 623a includes an opening or channel 2501 that is formed into the body or housing of the device. The channel 2501 is configured to receive the lug 2510 attached to an end of the band strap 621a. The receiving feature 623a may also include a locking mechanism 2530 that is configured to maintain the band strap 621a within the channel 2501 once it has been installed. As discussed above, the locking mechanism 2530 may be releasable by the user, which may facilitate band replacement. In this example, the locking mechanism 2530 includes a spring-loaded retaining mechanism that engages the lug 2510 to retain the lug 2510 in the channel 2501 and maintain the attachment of the band strap 621a to the device. As shown in FIG. 25A, the locking mechanism 2530 also includes a button located on the bottom of the housing that may be depressed by the user to release the locking mechanism and allow the lug 2510 and the band strap 621a to be removed from the channel 2501. In the present example, the button of the locking mechanism 2530 is located on a curved portion of the case or housing. In some embodiments, the button of the locking mechanism 2530 is located along the centerline of the case or housing.

[0276] In some embodiments, the opening or channel 2501 of the receiving feature 623a includes a port or connector for receiving a mating electrical component. In some embodiments, the connector or port is covered by a label or sticker so that the inside surface of the opening or channel 2501 appears continuous. The connector or port may be located along the vertical centerline of the case or housing.

[0277] FIG. 25B depicts an example exploded view of the receiving feature 623a and the lug 2510 of the band strap 621a. As shown in FIG. 25B, the band strap 621a may be formed from a separate part and attached to lug 2510 via a pivot or other type of joint. In other embodiments, the band strap 621a may have an end feature that is integrally formed as part of the band strap 621a. As also shown in FIG. 25B, the lug 2510 may be attached to the receiving feature 623a by aligning the axis of the lug 2510 with the axis of the channel 2501 and then sliding the lug 2510 into the channel 2501.

[0278] FIG. 25C depicts an example assembly sequence of the lug 2510 being inserted into the channel 2501 of the receiving feature 623a. As shown in FIG. 25C, the lug 2510 may be positioned along the side of the receiving feature 623a having the lug 2510 approximately aligned with the channel 2501 of the receiving feature 623a. The lug 2510 (and band strap 621a) may then be inserted into the channel 2501 of the receiving feature 623a by sliding the lug 2510 along the length of the channel 2501. Once the lug 2510 is approximately centered in the channel 2501 of the receiving feature 623a, the locking mechanism 2530 or other securing feature may engage, thereby retaining the lug 2510 (and band strap 621a) within the channel 2501. As previously discussed, the lug 2510 (and band strap 621a) may be removed from the receiving feature 623a by depressing the button of the locking mechanism 2530, which may disengage the lock and allow movement of the lug 2510 within the channel 2501.

[0279] The example described above is provided with respect to one example embodiment. The geometry of the end of the band strap and/or the geometry of the channel may vary depending on the implementation. Additionally, the engagement mechanism may vary depending on the design of the band strap and the device body. The geometry or layout of the features may vary and remain within the scope of the present disclosure. Additionally, while the examples provided above are described with respect to attaching a band strap to a device body, the

receiving feature (623a) may be used to attach a variety of other parts to the device body. For example a lanyard, cable, or other accessory may be attached to the device body using the receiving feature and other similar features.

12. Example Bands

[0280] As described above, a wearable electronic device may include a band that is used to secure the device to the wrist of a user. In some embodiments, the band may be formed from two band straps that are attached to the housing of the device body. The band straps may be secured around the wrist of a user by a clasp or latching mechanism. As also described above, the device may be configured to facilitate replacement of the band. This feature may allow the use of a variety of types of bands, which may adapt the device for multiple uses ranging from sporting activities to professional or social activities.

[0281] In some cases, the band may be formed from a woven textile material. In one example, the band is formed from a woven material that includes one or more strands or threads formed from a natural or synthetic material. The woven material may be formed, for example, from a plurality of warp threads that are woven around one or more weft threads. More specifically, the woven material may include a plurality of warp threads disposed along the length of the band, and at least one weft thread positioned perpendicular to, and coupled to, woven or interlaced between the plurality of warp threads. In some cases, the plurality of warp threads may run the entire length of the woven portion of the band strap. Additionally, in some cases, the at least one weft thread may include a single thread that may be continuously woven between the plurality of warp threads or, alternatively, may include a plurality of threads that may be woven between the plurality of warp threads. A weft thread that is woven between a plurality of warp threads may form consecutive cross-layers with respect to the plurality warp threads in order to form the band.

[0282] In some cases, one or more of the strands or threads may be a metallic or conductive material. This may improve the strength of the band and may also facilitate coupling with magnetic elements, such as a metallic clasp. In some cases, other elements may be woven into the band, including, for example, product identifying elements, decorative elements, or functional components.

[0283] In other embodiments, the band may be formed from a metallic mesh material. In one example, the metallic mesh is formed from an array of links that are interlocked to form a sheet of fabric. Some or all of the links in the mesh may be formed from a ferromagnetic material, which may facilitate magnetic engagement with a magnetic clasp. In some cases, each link of the mesh is formed from a section of metallic filament that is bent or formed into a closed shape. Each closed shape may be interlocked with one or more adjacent links to form a portion of the sheet or fabric. In some cases, a metallic filament is formed around a series of rods or pins that are disposed at a regular spacing within the mesh. In some cases, one or more strands or filaments that may be formed from a ferromagnetic material are woven or integrated with the links of the mesh.

[0284] In other examples, the band may be formed from a sheet of material. For example, the band may be formed from a synthetic leather, leather, or other animal hide. Additionally or alternatively, the band may be formed from a polymer material, an elastomer material, or other type of plastic or synthetic. In some cases, the band is formed from a silicone sheet material.

[0285] The clasp that is used to attach the free ends of the band straps may vary depending on the material that is used and the construction of the band. For example, as mentioned above, a metallic mesh material may use a metallic clasp to join the ends of the band. Additionally, a leather band may be integrated with magnetic and/or ferromagnetic components and may include a magnetic clasp. In some embodiments, the free ends of the band straps are secured using a buckle or tang on a first band strap that is configured to interface with a hole or aperture in a second band strap. A variety of other clasp configurations may also be used.

13. Example Display

[0286] For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above. As described above, the device includes a display disposed within the housing or enclosure. The device may be formed from a liquid crystal display (LCD), organic light emitting diode (OLED) display, organic electroluminescence (OEL) display, or other type of display device. The display may be used to present visual information

to the user, including, for example, a graphical user interface, notifications, health statistics, and the like. In some cases, the display may be configured to present the current time and date similar to a traditional watch or timepiece.

[0287] In some embodiments, the display is formed from an organic light emitting diode (OLED) display element. An active region of the display may include an array of light-emitting display pixels 2604 such as array 2602, shown in FIG. 26. Pixels 2604 may be arranged in rows and columns in array 2602 and may be controlled using a pattern of control lines. Each pixel may include a light-emitting element such as organic light-emitting diode 2612 and associated control circuitry 2610. Control circuitry 2610 may be coupled to the data lines 2606 and gate lines 2608 so that control signals may be received from driver circuitry, which may be implemented as an integrated circuit. Although described as an OLED display, certain embodiments may implement other display technology, such as LCD displays and the like.

[0288] To the extent that multiple functionalities, operations, and structures are disclosed as being part of, incorporated into, or performed by device 100, it should be understood that various embodiments may omit any or all such described functionalities, operations, and structures. Thus, different embodiments of the device 100 may have some, none, or all of the various capabilities, apparatuses, physical features, modes, and operating parameters discussed herein

[0289] Although the disclosure above is described in terms of various exemplary embodiments and implementations, it should be understood that the various features, aspects and functionality described in one or more of the individual embodiments are not limited in their applicability to the particular embodiment with which they are described, but instead can be applied, alone or in various combinations, to one or more of the other embodiments of the invention, whether or not such embodiments are described and whether or not such features are presented as being a part of a described embodiment. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments but instead defined by the claims herein presented.

CLAIMS

We claim:

1. A wearable electronic device, comprising:
 - a housing comprising:
 - a flat bottom portion;
 - a top portion defining a cavity; and
 - a curved side portion that extends from the bottom portion to the top portion;
 - a band attached to the housing and configured to secure the wearable electronic device to a user;
 - a display at least partially disposed within the cavity and having a viewable area; and
 - a cover disposed above the display and comprising:
 - a flat middle portion larger than the viewable area of the display; and
 - a curved edge portion surrounding the flat middle portion and coinciding with the curved side portion along a perimeter of the cavity to form a continuous contoured surface.
2. The wearable electronic device of claim 1, wherein:
 - the continuous contoured surface is tangent with the flat bottom portion of the housing at a first end of the contour; and
 - the continuous contoured surface is tangent with the flat middle portion of the cover at a second end of the contour.
3. The wearable electronic device of claim 2, wherein the continuous contoured surface has a constant radius.
4. The wearable electronic device of claim 1, wherein
 - the cavity has a rectangular shape;
 - the curved edge portion of the housing has four sides that surround the cavity;
 - each side is orthogonal to two adjacent sides; and
 - each side is connected to an adjacent side by a rounded corner.
5. The wearable electronic device of claim 4, wherein:

the rounded corners have a curvature that corresponds to a curvature of the continuous contoured surface formed by the curved edge portion of the cover and the curved side portion of the housing.

6. The wearable electronic device of claim 1, further comprising:
a crown module positioned at least partially within an aperture formed within the curved side portion of the housing; wherein:
the crown module comprises an outer surface configured to receive a rotary user input.
7. The wearable electronic device of claim 6, wherein:
the crown module is offset with respect to a centerline of the housing between the top portion and the flat bottom portion; and
the offset is toward the top portion of the housing; and
the crown module includes a dial having a portion that is higher than an interface between the cover and the housing.
8. The wearable electronic device of claim 1, further comprising:
a port formed in the curved side portion of the housing;
an acoustic module disposed within the housing and configured to produce an audio output through the port, the acoustic module comprising:
an acoustic element; and
an acoustic cavity that acoustically couples the acoustic element to the port;
wherein:
the port includes an orifice that is offset with respect to the acoustic cavity to prevent the direct ingress of liquid into the acoustic module.
9. The wearable electronic device of claim 1, further comprising:
a gasket positioned between the housing and the cover; and
a ledge formed along a perimeter of the cavity, wherein:
the gasket is positioned along the ledge that is formed along the perimeter of the cavity; and

the gasket, the cover, and the housing are configured to cooperate to form a substantially water-proof seal.

10. The wearable electronic device of claim 1, further comprising:
 - a biosensor module disposed in an opening formed in the flat bottom portion of the housing, the biosensor module comprising:
 - a chassis positioned in the opening of the housing and defining an array of windows;
 - an array of light sources attached to the chassis and configured to emit light into the user through the array of windows; and
 - an optically transparent rear cover disposed over the chassis and over the array of windows and operative to pass light emitted from the array of light sources into the user.
11. The wearable electronic device of claim 10, wherein the rear cover has a convex outer contour.
12. An electronic device, comprising:
 - a housing comprising a bottom portion defining an opening;
 - a band attached to the housing and configured to secure the electronic device to a user;
 - a biosensor module disposed within the opening;
 - a rear cover disposed over the biosensor module and comprising
 - an edge protruding outwardly from the bottom portion of the housing; and
 - an outer surface having a convex curved contour.
13. The electronic device of claim 12, wherein:
 - the outer surface of the rear cover defines one or more windows that provide operational access to one or more optical components of the biosensor module; and
 - the one or more windows have a curvature that matches the convex curved contour of the outer surface.

14. The electronic device of claim 12, wherein the biosensor module comprises:
an array of light sources configured to emit light into a body of the user; and
a photodetector configured to receive light produced by a light source of the array of light sources that is reflected from the body and produce a sensor signal.
15. The electronic device of claim 14, further comprising:
a processing unit configured to compute a health metric associated with the user based on the sensor signal; and
a display disposed within the housing and configured to display the health metric
16. The electronic device of claim 12, wherein the biosensor module is removably coupled to the housing.
17. A wearable electronic device, comprising:
a housing comprising:
a top portion;
a cavity formed within the top portion; and
a curved side portion that surrounds the cavity; and
a transparent cover disposed over the cavity of the housing and comprising:
a flat middle portion at a center of the transparent cover;
a curved outer portion that emanates from and surrounds the flat middle portion and extends outwardly to an edge of the transparent cover; and
a mask positioned relative to an internal surface of the transparent cover, wherein the mask has an outer boundary located proximate to the edge of the transparent cover and an inner boundary located within the curved outer portion of the transparent cover.
18. The wearable electronic device of claim 17, further comprising:
a display disposed below the transparent cover, wherein a perimeter portion of a viewable area of the display is disposed below the mask.
19. The wearable electronic device of claim 17, wherein the device further comprises:

an antenna having a shape that corresponds to a shape of the cavity formed within the housing, wherein:

the antenna is disposed in a groove formed in the internal surface of the transparent cover; and

the groove is formed between the outer boundary and the inner boundary of the mask.

20. The wearable electronic device of claim 19, wherein:

the cover is formed from a sapphire material; and

the antenna is configured to facilitate wireless communication between the wearable electronic device and an external device.

21. An electronic device, comprising:

a housing comprising:

a first end;

a second end opposite the first end;

a first side extending between the first and second ends; and

a second side opposite to the first side and extending between the first and second ends, wherein:

the first end defines a first groove extending between the first and second sides and is configured to receive a first lug portion of a first band;

the second end defines a second groove extending between the first and second sides and is configured to receive a second lug portion of a second band; and

the first and second grooves have an inwardly curved concave shape with an undercut feature that retains the first and second lug portions.

22. The electronic device of claim 21, wherein the first groove extends through a solid portion of the housing to form a continuous interior shape.

23. The electronic device of claim 21, further comprising:

a display at least partially disposed within a cavity of the housing; and

a cover disposed above the display; wherein
at least a portion of the first groove is disposed below the cover.

24. The electronic device of claim 21, wherein the first and second grooves are formed at an angle with respect to a centerline of the housing.

25. The electronic device of claim 24, wherein:
the first and second grooves are angled upward toward a top of the housing and inward toward the center of the housing; and
the first and second grooves cross the centerline of the housing.

26. A wearable electronic device comprising:
a housing;
a band attached to the housing and configured to secure the wearable electronic device to a user;
a crown disposed relative to the housing and configured to receive a rotational input;
an encoder operatively coupled to the crown and configured to produce an encoder output that corresponds to the rotational input;
a speaker module disposed within the housing and configured to produce an audio output that corresponds to the encoder output; and
a haptic device disposed within the housing and configured to produce a haptic output that corresponds to the encoder output.

27. The wearable electronic device of claim 26, wherein the haptic output is synchronized with the audio output.

28. The wearable electronic device of claim 26, wherein the crown is further configured to translate along an axis and actuate a tactile switch.

29. The wearable electronic device of claim 26, further comprising:
a display element within the housing; and wherein the device is configured to:

display a list of items on the display element;
scroll the list of items in response to the encoder output, and
synchronize the audio and haptic outputs with the scrolling of the list of items.

30. The wearable electronic device of claim 29, wherein
the crown is further configured to translate along an axis and actuate a tactile switch, and
the crown is operative to select an item of the list of items when the tactile switch is
actuated.

31. A wearable electronic device comprising:
a housing comprising:
a bottom portion; and
an aperture formed in the bottom portion;
a band attached to the housing and configured to secure the wearable electronic device to
a user;
a biosensor module disposed in the aperture of the housing and comprising:
an array of light sources configured to emit light into a body of the user; and
a photodetector configured to receive light produced by a light source of the array
of light sources that is reflected from the body and produce a sensor signal;
a processing unit configured to compute a health metric associated with the user based on
the sensor signal; and
a display disposed within the housing and configured to display the health metric.

32. The wearable electronic device of claim 31, wherein:
the array of light sources and the photodetector are configured to function as multiple
photoplethysmography (PPG) sensors; and
each PPG sensor configured to be used to compute a separate health metric.

33. The wearable electronic device of claim 31, wherein:
- a first light source of the array of light sources includes a green LED adapted to detect blood perfusion in the body; and
 - a second light source of the array of light sources includes an infrared LED adapted to detect water content of the body.
34. The wearable electronic device of claim 31, wherein the health metric includes one or more of: a heart rate, a respiration rate, a blood oxygenation level, and a blood volume estimate.

ABSTRACT

A consumer product that is a portable and, in some cases, a wearable electronic device. The wearable electronic device may have functionalities including: keeping time; monitoring a user's physiological signals and providing health-related information based on those signals; communicating with other electronic devices or services; visually depicting data on a display; gather data from one or more sensors that may be used to initiate, control, or modify operations of the device; determine a location of a touch on a surface of the device and/or an amount of force exerted on the device, and use either or both as input.

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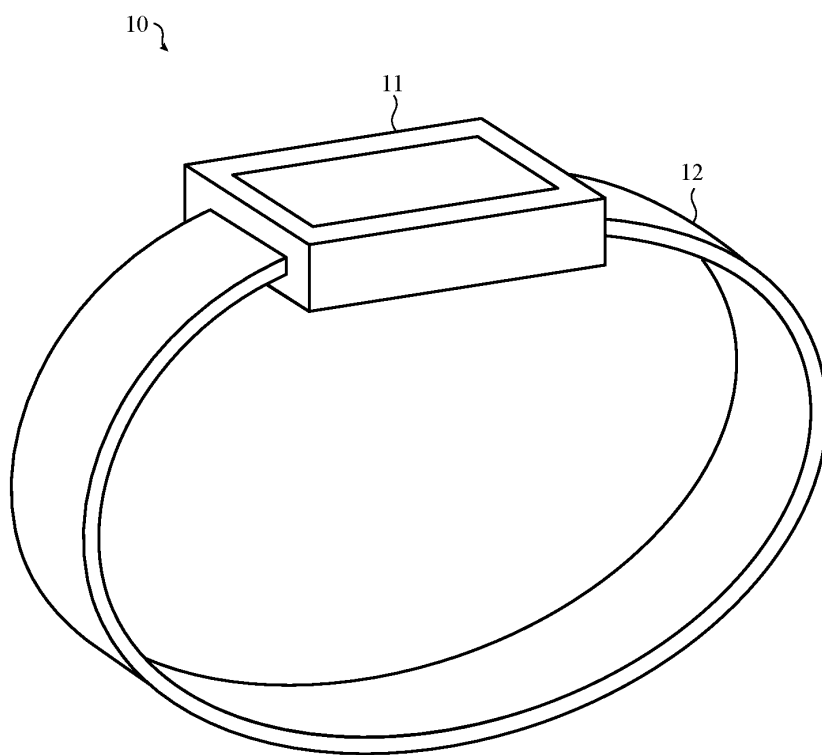


FIG. 1

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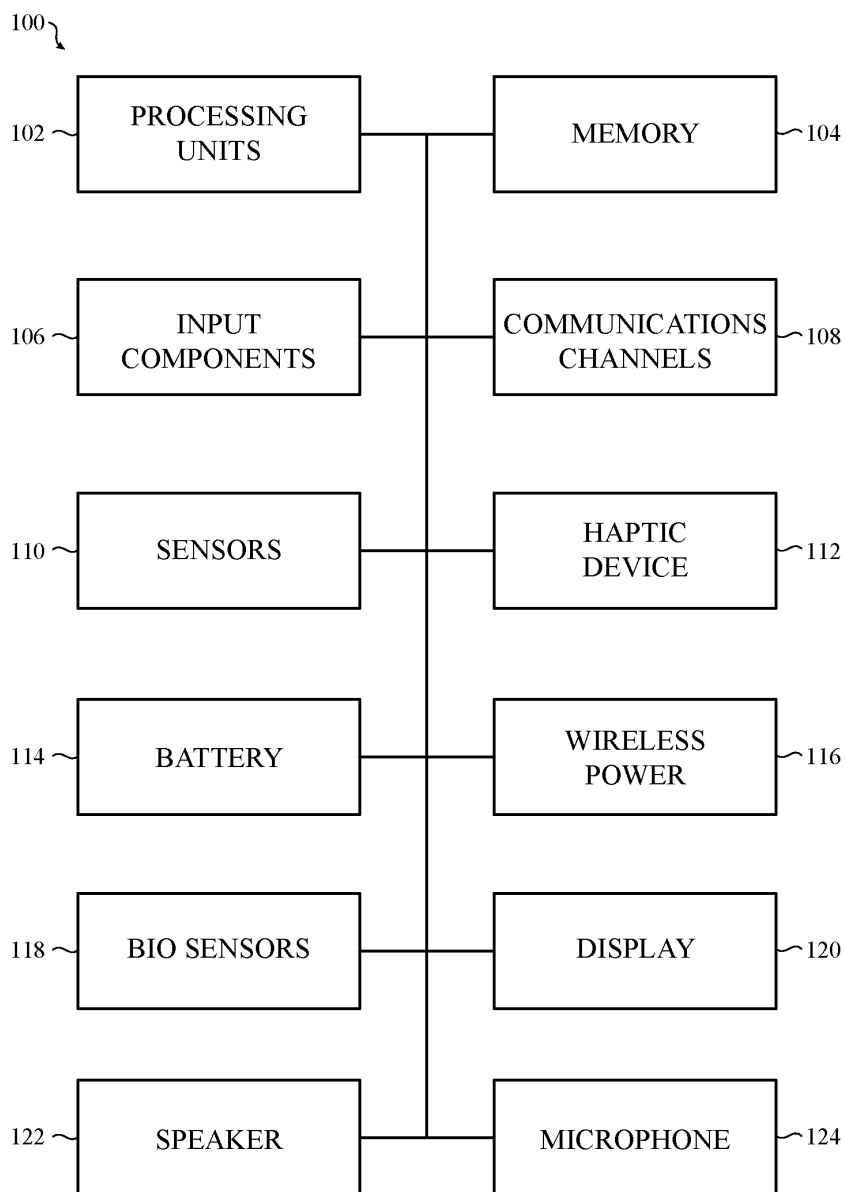


FIG. 2

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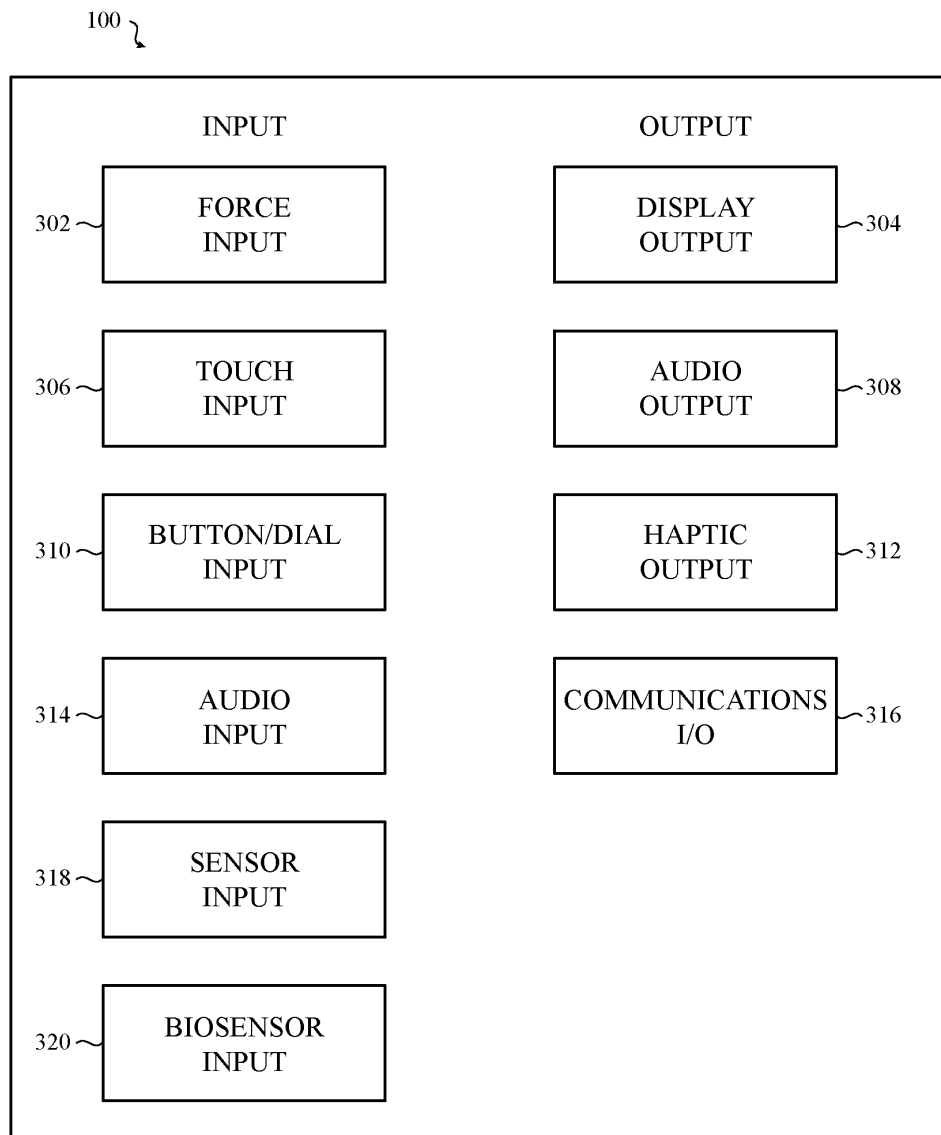


FIG. 3

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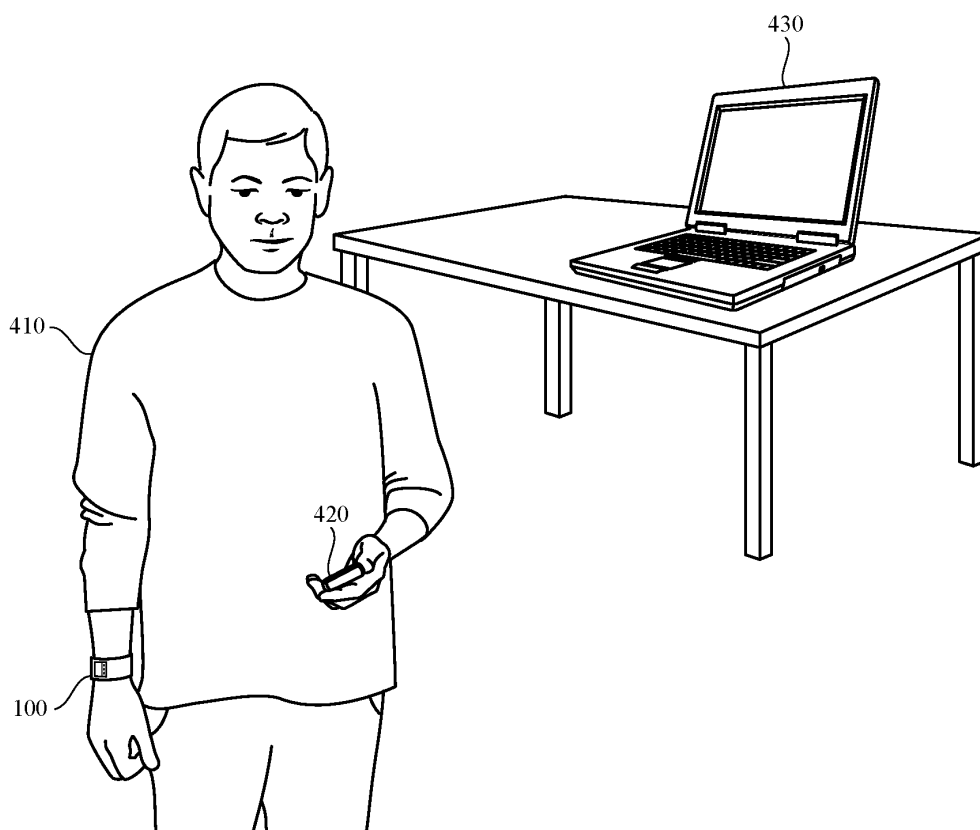


FIG. 4

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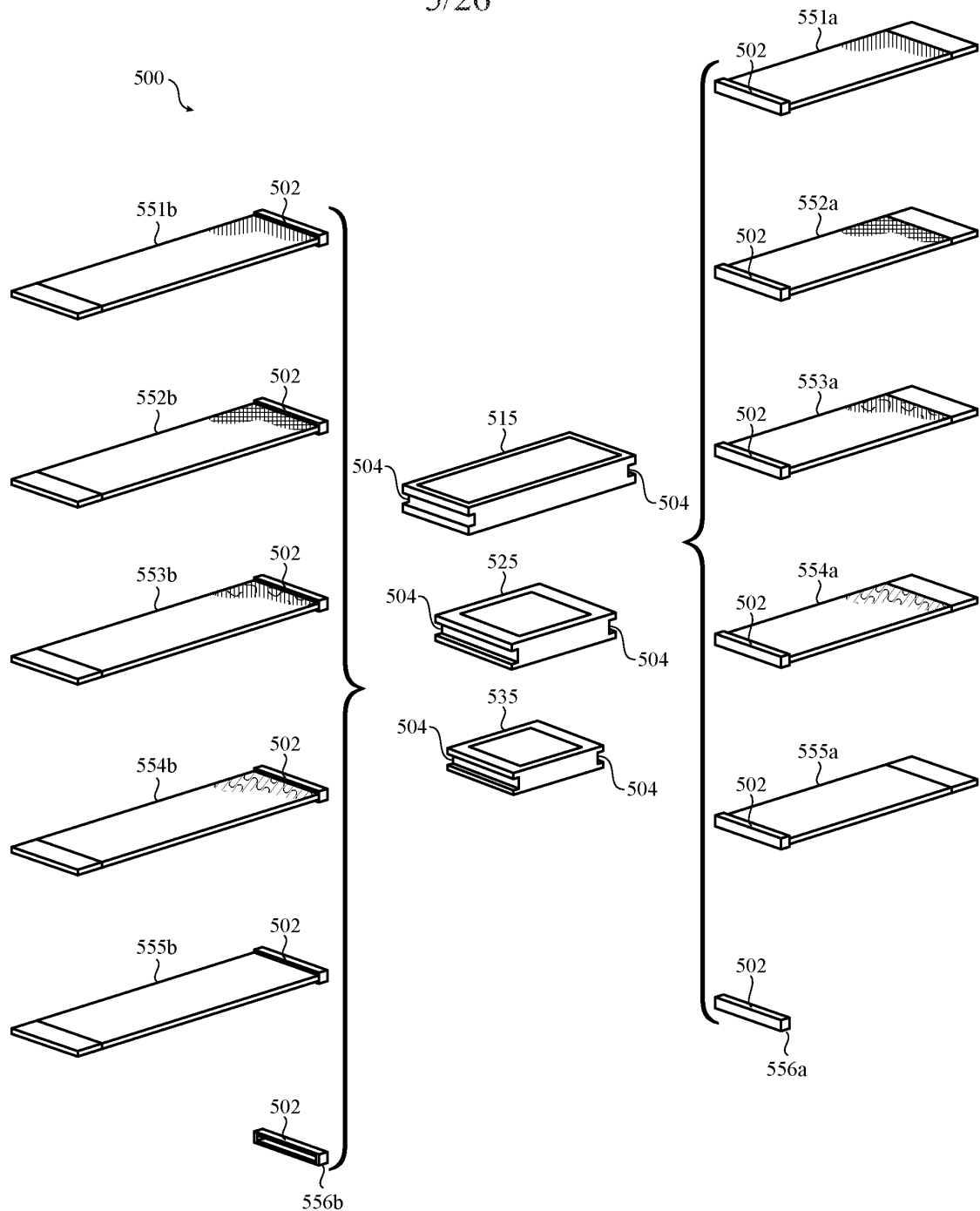


FIG. 5

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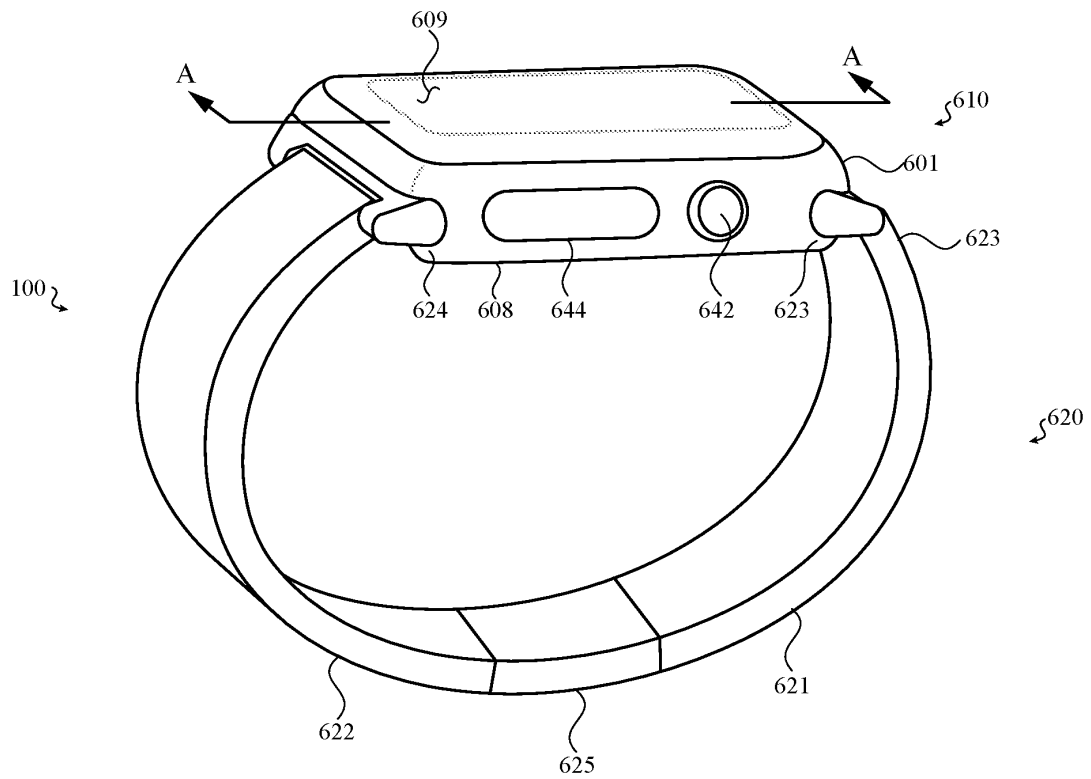


FIG. 6

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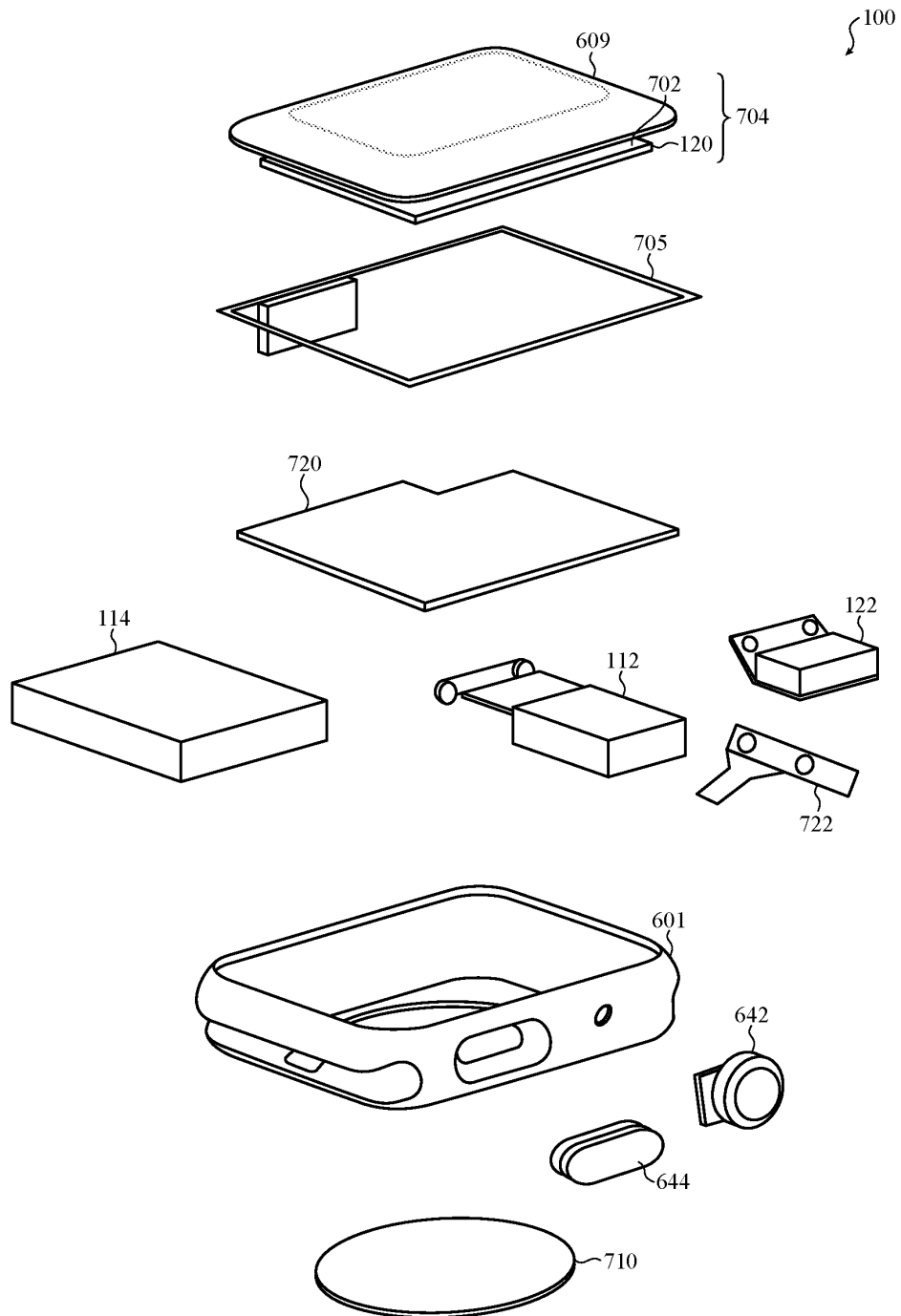


FIG. 7

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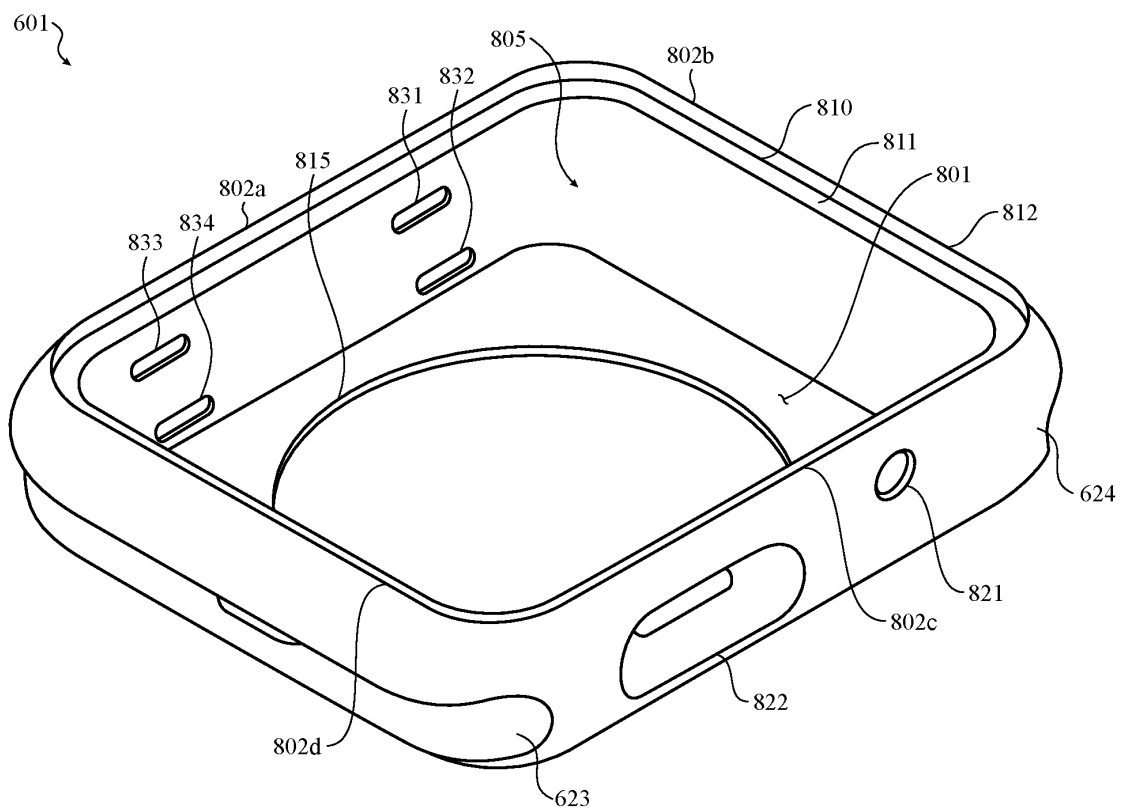


FIG. 8

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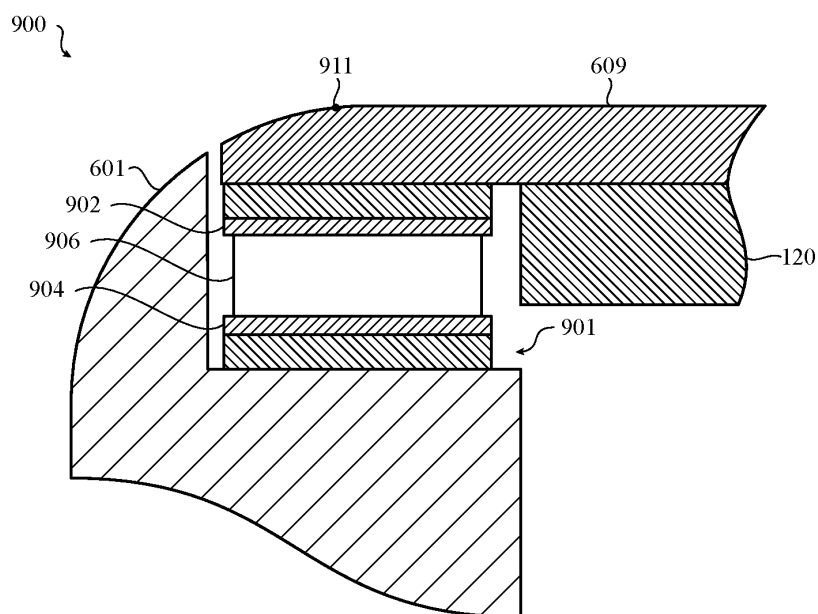


FIG. 9

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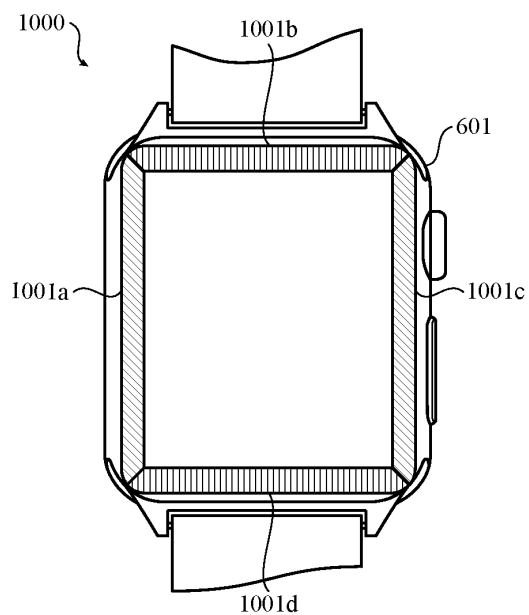


FIG. 10A

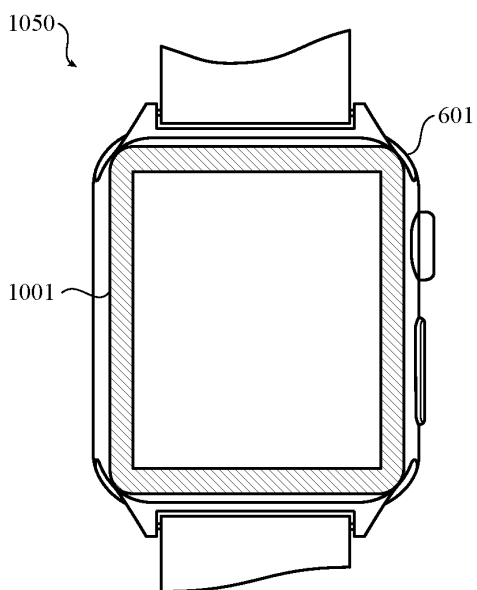


FIG. 10B

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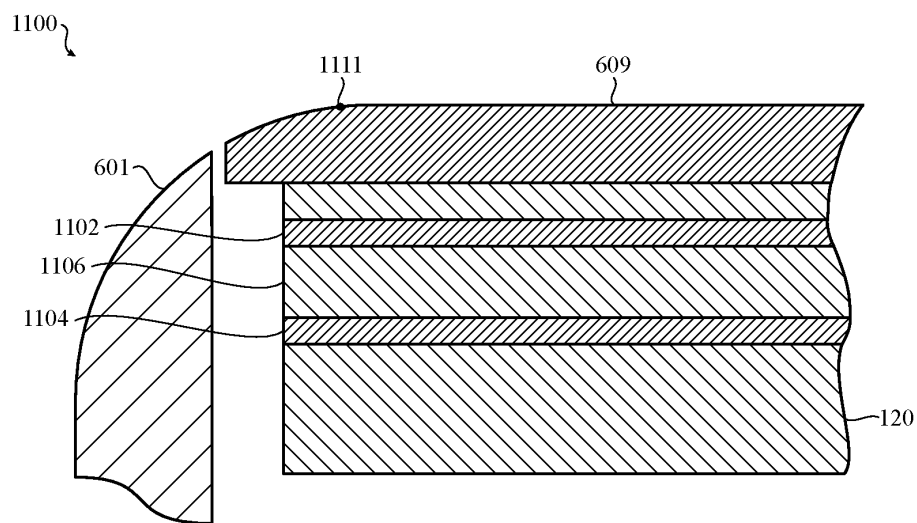


FIG. 11

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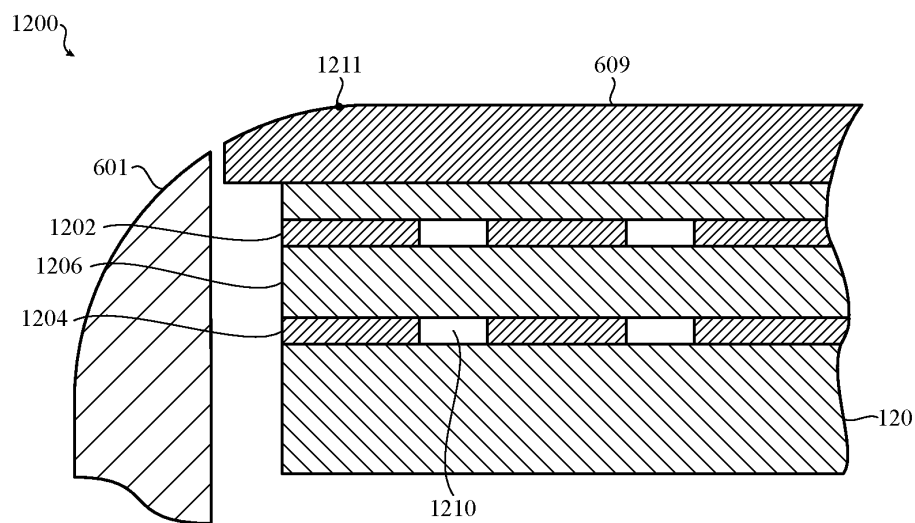


FIG. 12

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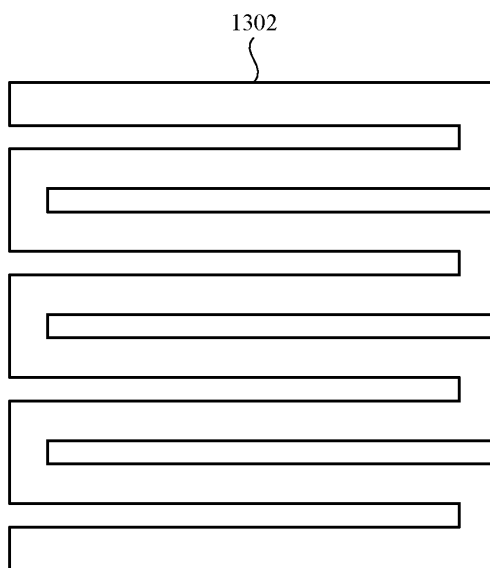


FIG. 13A

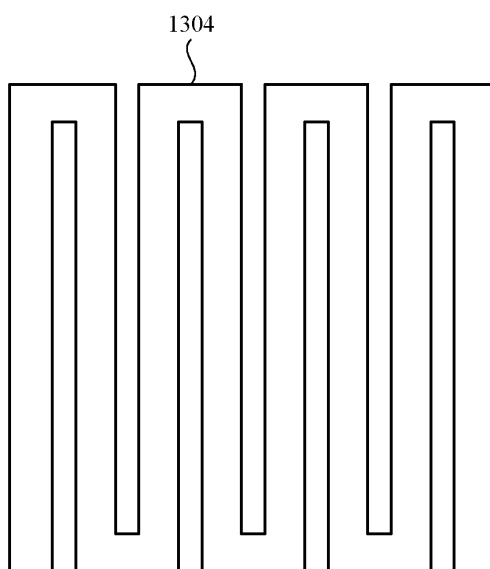


FIG. 13B

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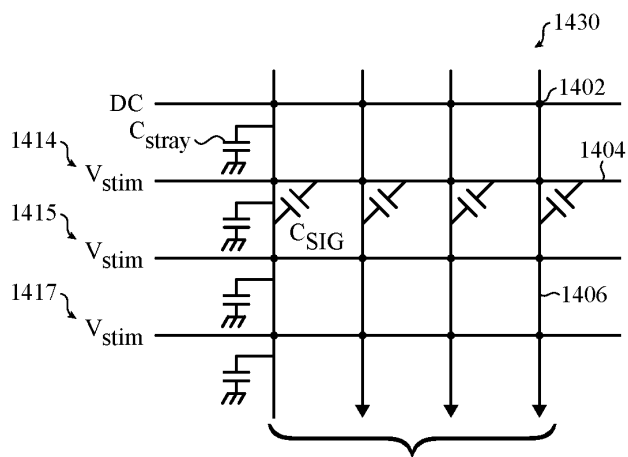


FIG. 14A

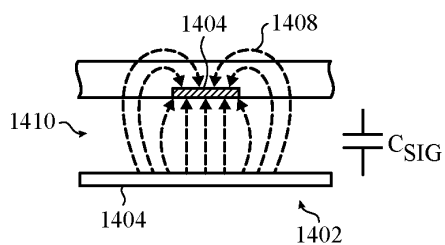


FIG. 14B

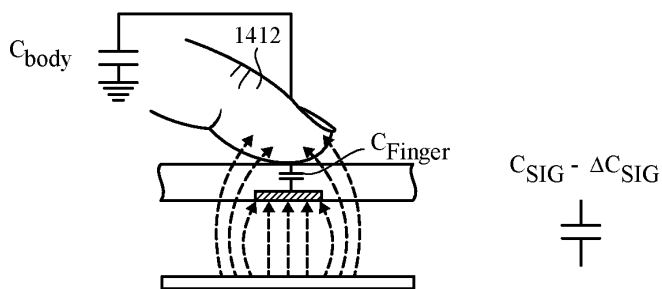


FIG. 14C

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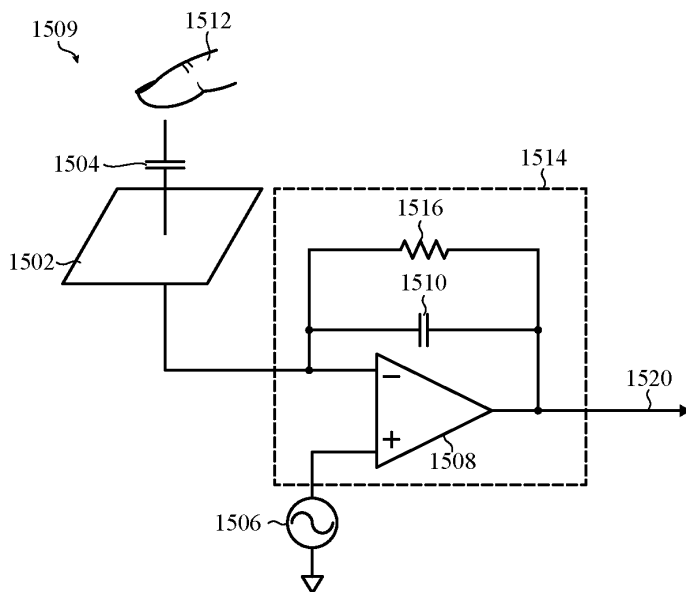


FIG. 15A

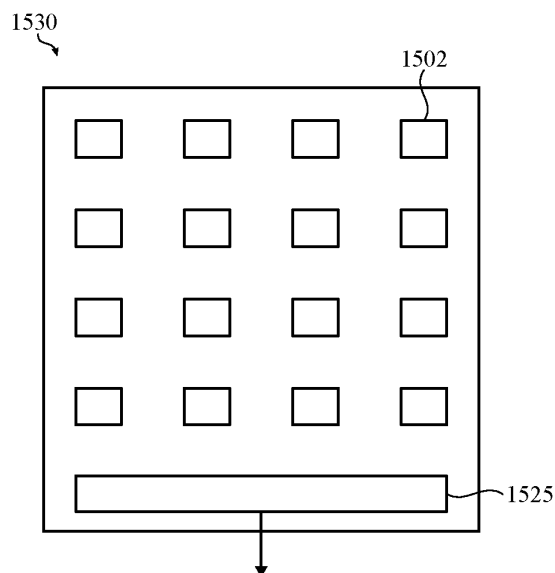


FIG. 15B

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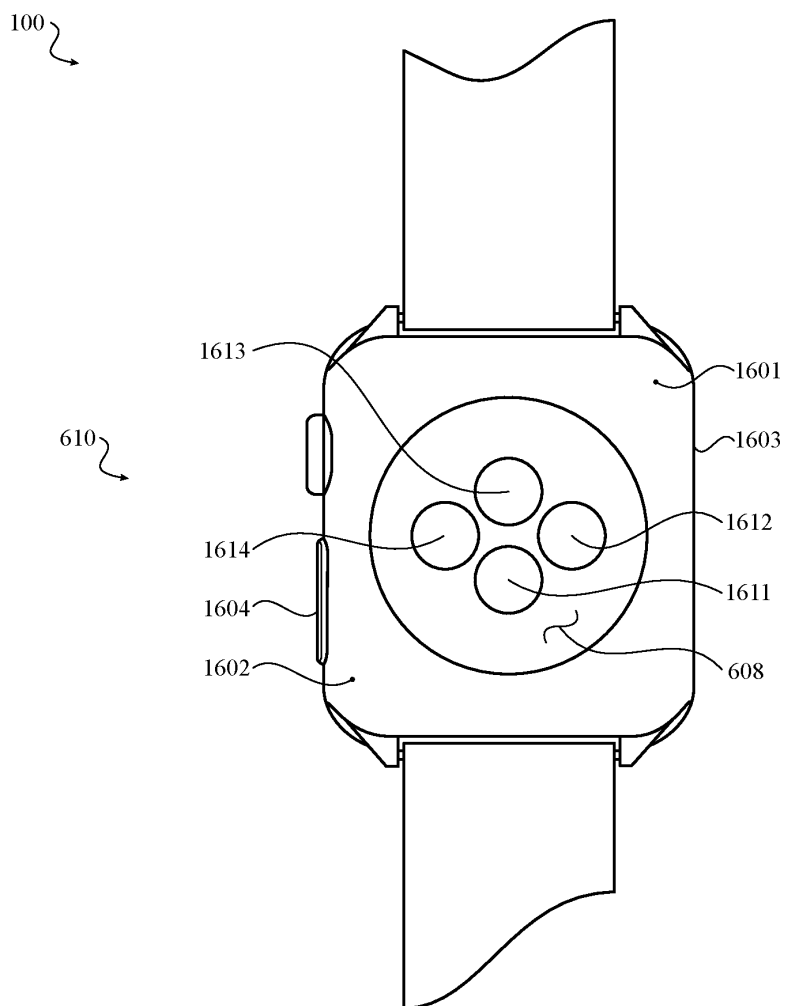


FIG. 16

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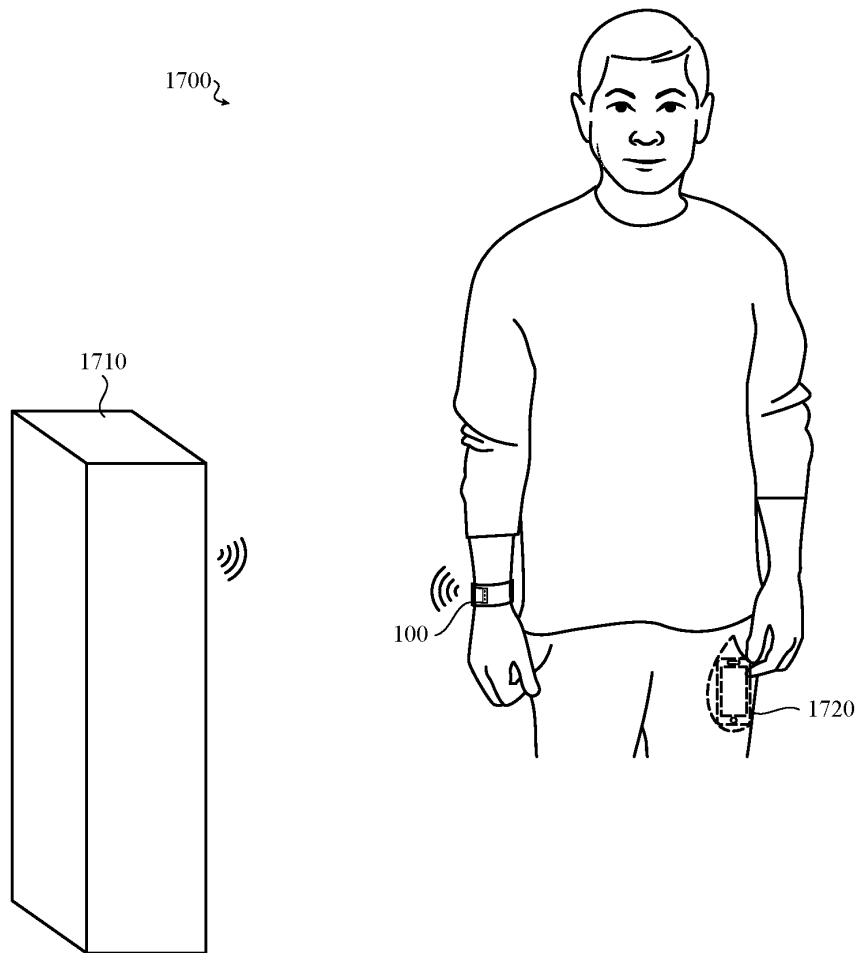


FIG. 17

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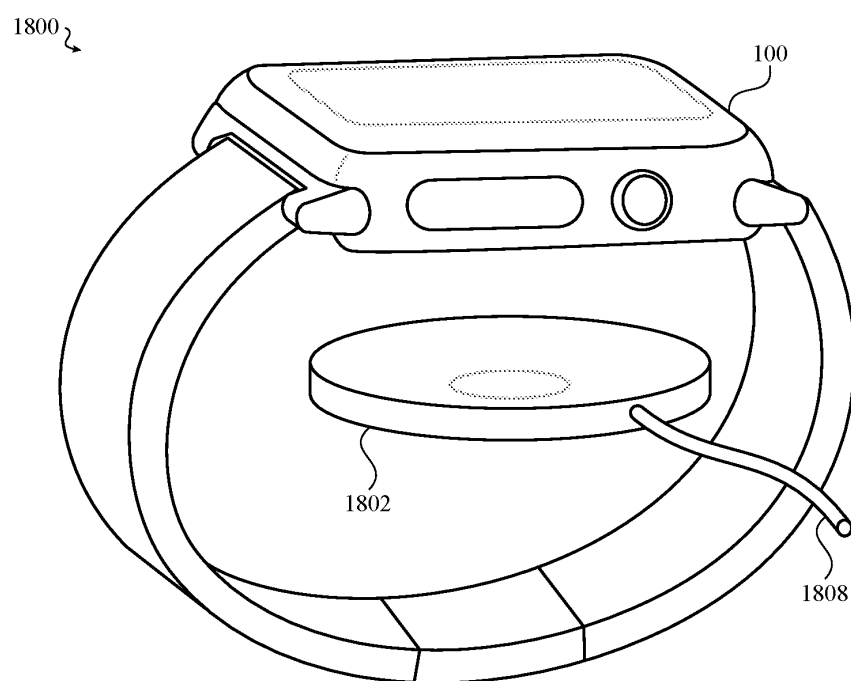


FIG. 18

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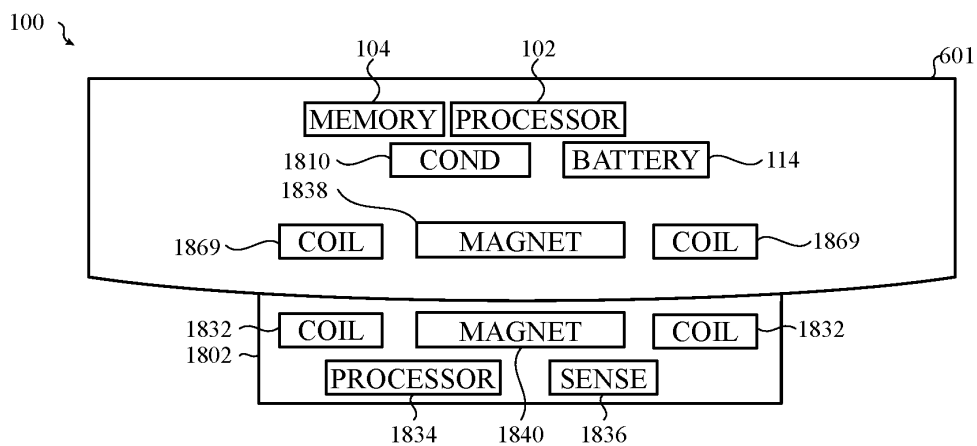


FIG. 19

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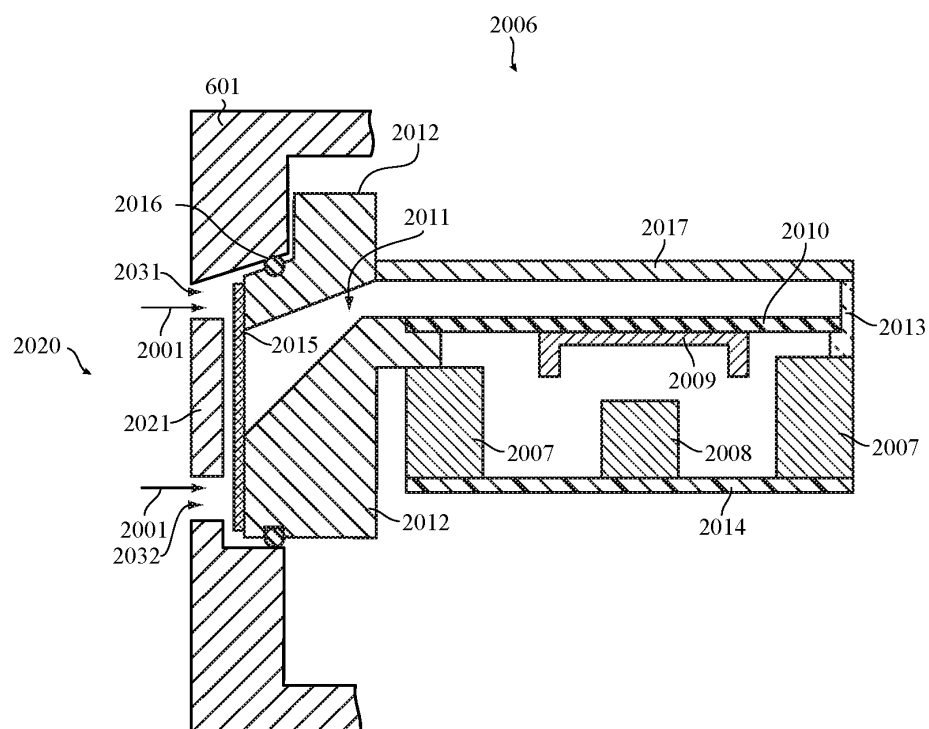


FIG. 20

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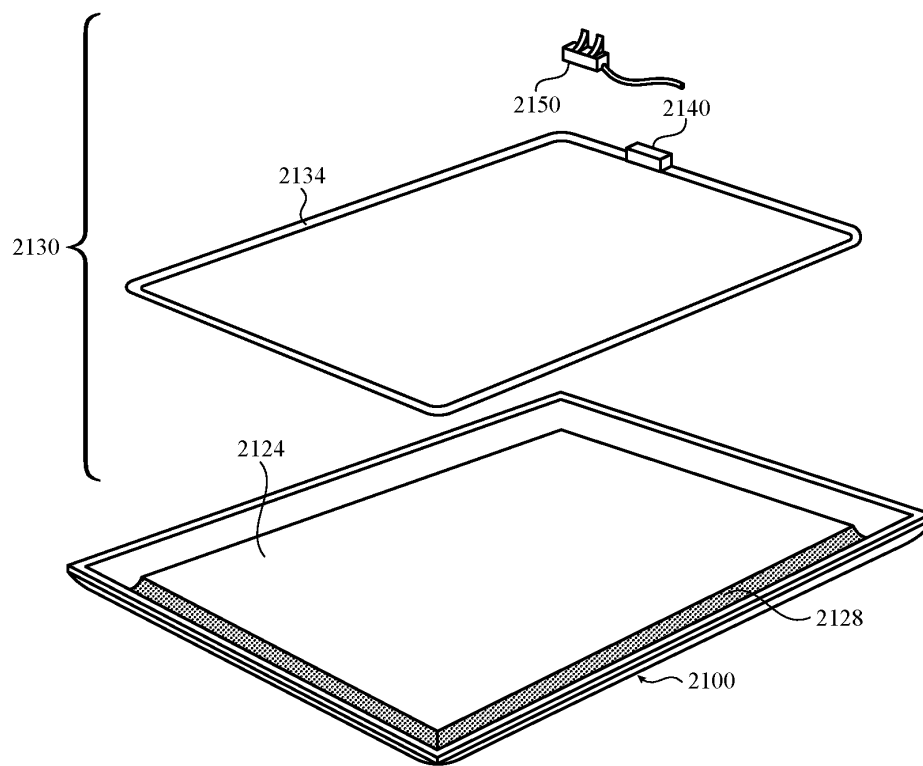


FIG. 21A

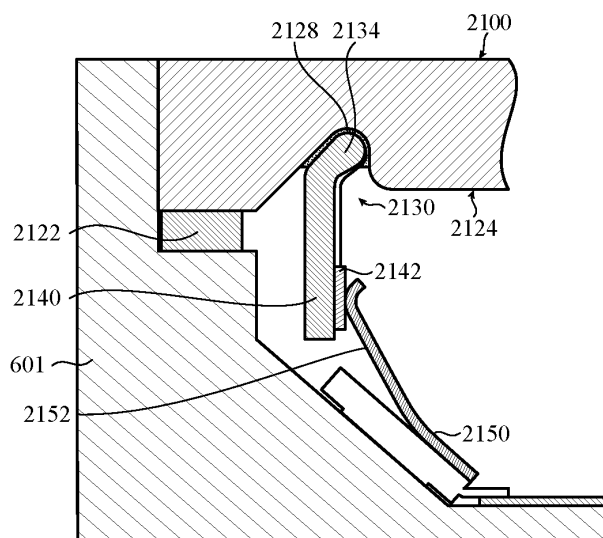


FIG. 21B

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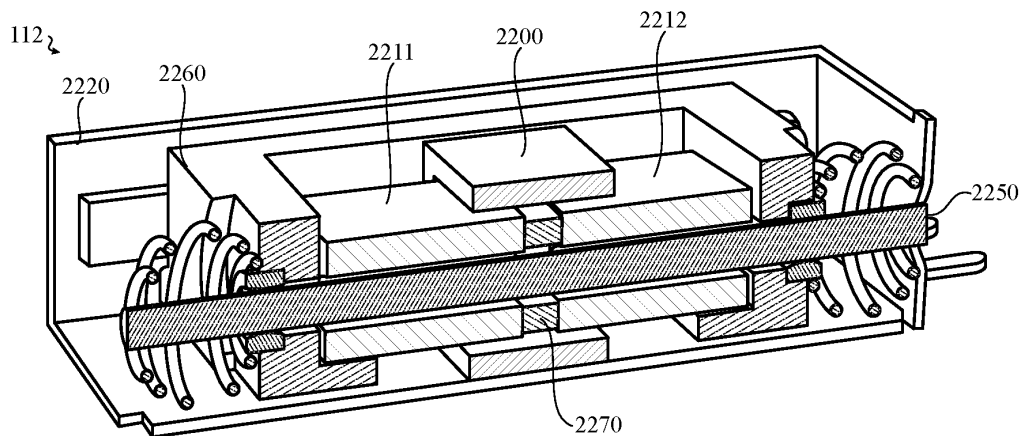


FIG. 22A

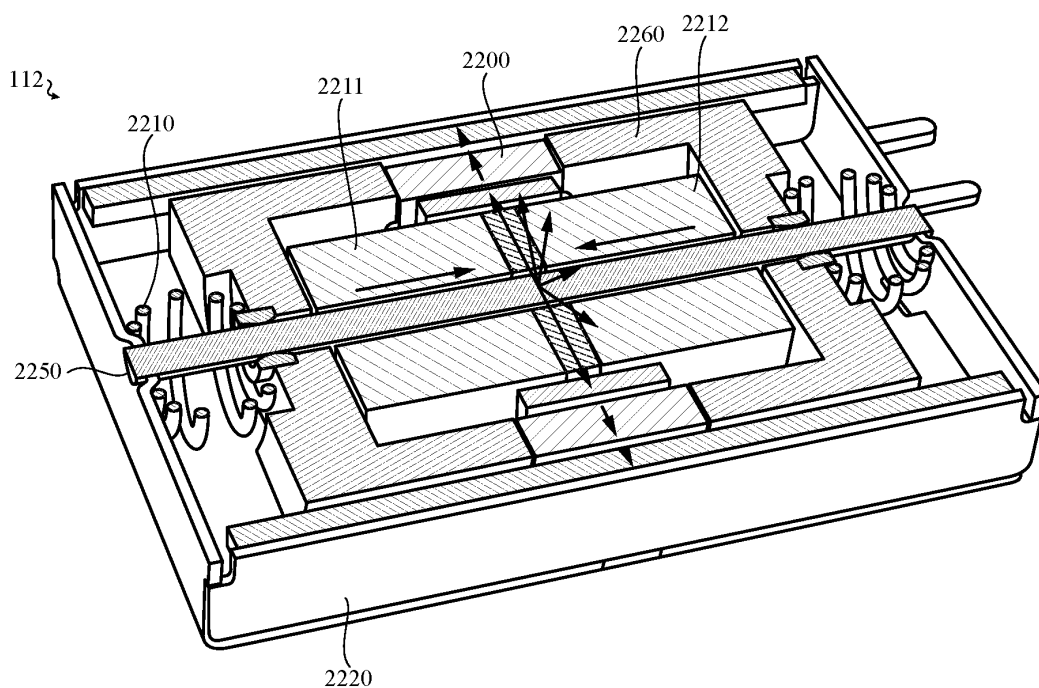


FIG. 22B

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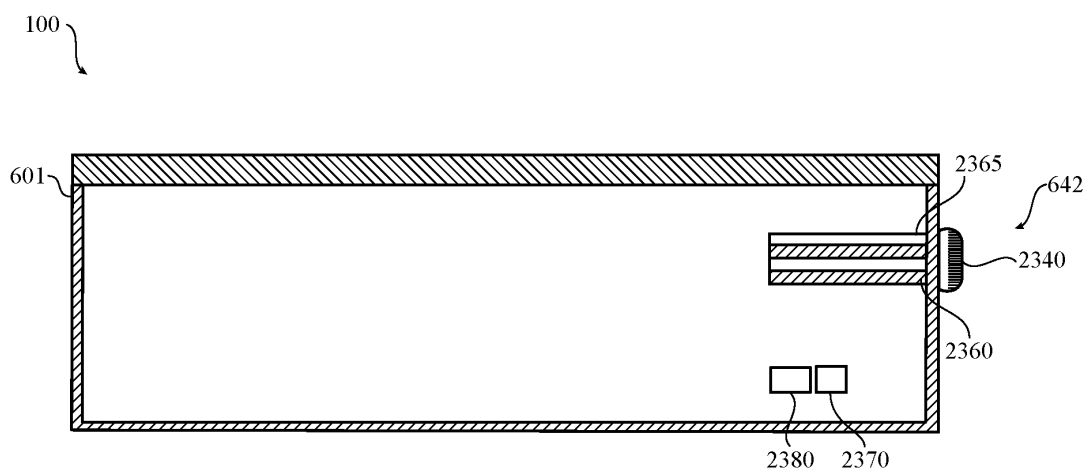


FIG. 23

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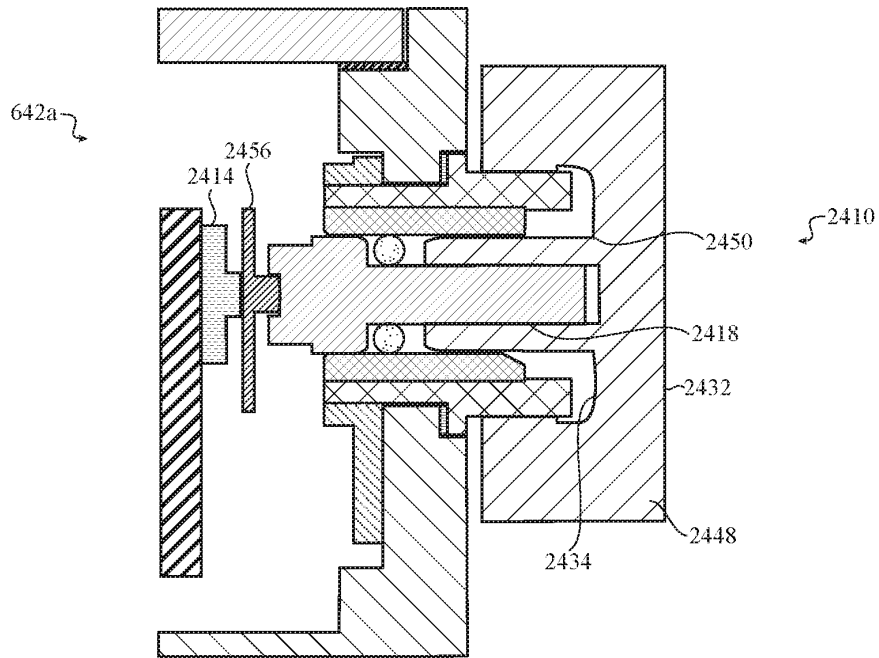


FIG. 24A

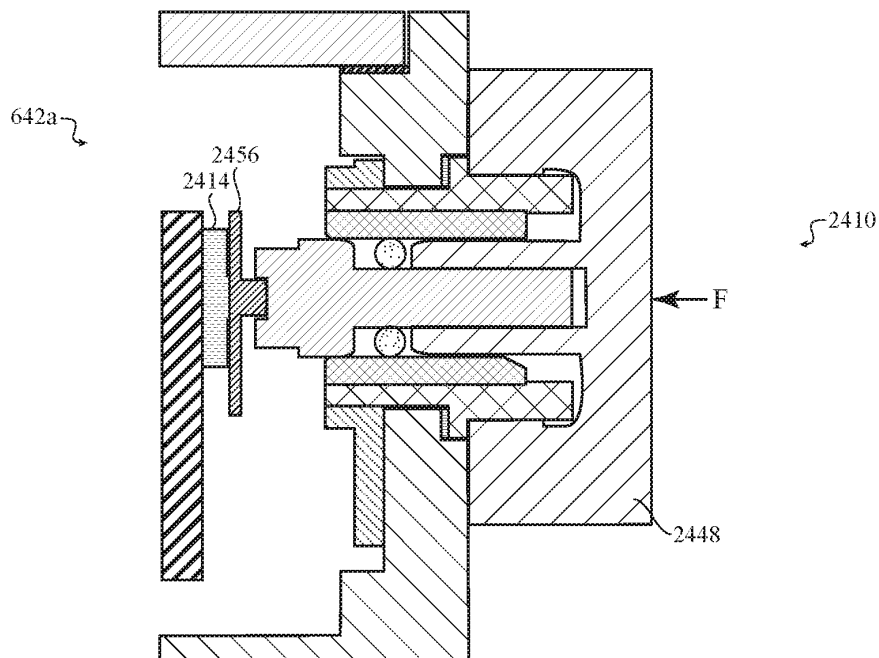


FIG. 24B

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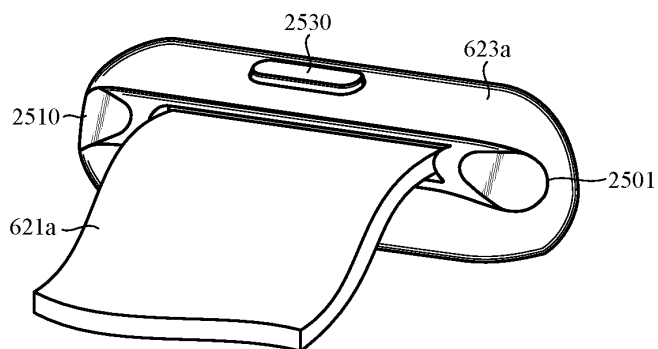


FIG. 25A

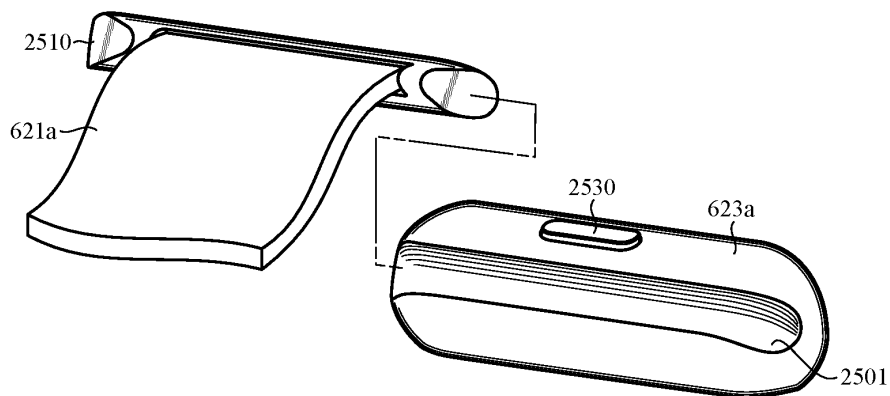


FIG. 25B

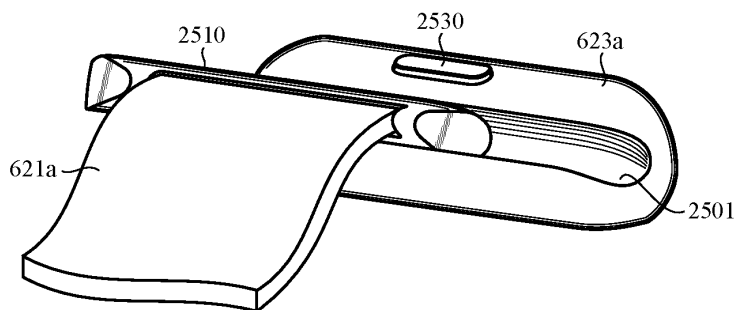


FIG. 25C

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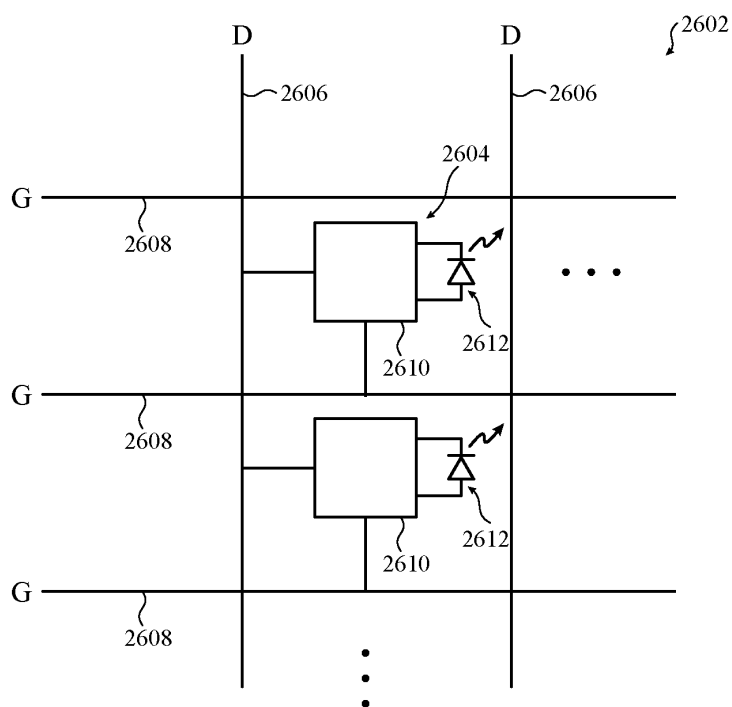
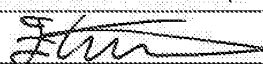


FIG. 26

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	WEARABLE ELECTRONIC DEVICE AND ASSOCIATED METHODS OF USE AND MANUFACTURE	
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____ The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.		
LEGAL NAME OF INVENTOR		
Inventor:	Fletcher R. Rothkopf	Date (Optional): _____
Signature:		
Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.		

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor(s): Fletcher R. Rothkopf	
App. No.: Not Yet Assigned	Con. No.: Not Yet Assigned
Filed: Herewith	Art Unit: Not Yet Assigned
Title: WEARABLE ELECTRONIC DEVICE	Examiner: Not Yet Assigned

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

Please amend the above-identified application as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims begin on page 3 of this paper.

Remarks begin on page 7 of this paper.

Amendments to the Specification:

Please replace paragraph [0001] with the following paragraph, marked to show changes:

This application is a continuation patent application of U.S. Patent Application No. 14/842,617, filed September 1, 2015 and titled "Wearable Electronic Device," which is a nonprovisional patent application of and claims the benefit of U.S. Provisional Patent Application No. 62/044,974, filed September 2, 2014 and titled "Wearable Electronic Device and Associated Methods of Use and Manufacture," the disclosures of which ~~[[is]]~~are hereby incorporated herein by reference in ~~[[its]]~~their ~~entiret~~entireties.

Amendments to the Claims:

1. (Original) A wearable electronic device, comprising:
a housing comprising:
a flat bottom portion;
a top portion defining a cavity; and
a curved side portion that extends from the bottom portion to the top portion;

a band attached to the housing and configured to secure the wearable electronic device to a user;
a display at least partially disposed within the cavity and having a viewable area; and
a cover disposed above the display and comprising:
a flat middle portion larger than the viewable area of the display; and
a curved edge portion surrounding the flat middle portion and coinciding with the curved side portion along a perimeter of the cavity to form a continuous contoured surface.
2. (Original) The wearable electronic device of claim 1, wherein:
the continuous contoured surface is tangent with the flat bottom portion of the housing at a first end of the contour; and
the continuous contoured surface is tangent with the flat middle portion of the cover at a second end of the contour.
3. (Original) The wearable electronic device of claim 2, wherein the continuous contoured surface has a constant radius.
4. (Original) The wearable electronic device of claim 1, wherein
the cavity has a rectangular shape;
the curved edge portion of the housing has four sides that surround the cavity;
each side is orthogonal to two adjacent sides; and
each side is connected to an adjacent side by a rounded corner.
5. (Original) The wearable electronic device of claim 4, wherein:
the rounded corners have a curvature that corresponds to a curvature of the continuous contoured surface formed by the curved edge portion of the cover and the curved side portion of the housing.
6. (Original) The wearable electronic device of claim 1, further comprising:

a crown module positioned at least partially within an aperture formed within the curved side portion of the housing; wherein:

the crown module comprises an outer surface configured to receive a rotary user input.

7. (Original) The wearable electronic device of claim 6, wherein:
the crown module is offset with respect to a centerline of the housing between the top portion and the flat bottom portion; and
the offset is toward the top portion of the housing; and
the crown module includes a dial having a portion that is higher than an interface between the cover and the housing.

8. (Original) The wearable electronic device of claim 1, further comprising:
a port formed in the curved side portion of the housing;
an acoustic module disposed within the housing and configured to produce an audio output through the port, the acoustic module comprising:
an acoustic element; and
an acoustic cavity that acoustically couples the acoustic element to the port;
wherein:
the port includes an orifice that is offset with respect to the acoustic cavity to prevent the direct ingress of liquid into the acoustic module.

9. (Original) The wearable electronic device of claim 1, further comprising:
a gasket positioned between the housing and the cover; and
a ledge formed along a perimeter of the cavity, wherein:
the gasket is positioned along the ledge that is formed along the perimeter of the cavity; and
the gasket, the cover, and the housing are configured to cooperate to form a substantially water-proof seal.

10. (Original) The wearable electronic device of claim 1, further comprising:
a biosensor module disposed in an opening formed in the flat bottom portion of the housing, the biosensor module comprising:
a chassis positioned in the opening of the housing and defining an array of windows;
an array of light sources attached to the chassis and configured to emit light into the user through the array of windows; and

an optically transparent rear cover disposed over the chassis and over the array of windows and operative to pass light emitted from the array of light sources into the user.

11. (Original) The wearable electronic device of claim 10, wherein the rear cover has a convex outer contour.

12. (Original) An electronic device, comprising:
a housing comprising a bottom portion defining an opening;
a band attached to the housing and configured to secure the electronic device to a user;
a biosensor module disposed within the opening;
a rear cover disposed over the biosensor module and comprising
an edge protruding outwardly from the bottom portion of the housing; and
an outer surface having a convex curved contour.

13. (Original) The electronic device of claim 12, wherein:
the outer surface of the rear cover defines one or more windows that provide operational access to one or more optical components of the biosensor module; and
the one or more windows have a curvature that matches the convex curved contour of the outer surface.

14. (Original) The electronic device of claim 12, wherein the biosensor module comprises:
an array of light sources configured to emit light into a body of the user; and
a photodetector configured to receive light produced by a light source of the array of light sources that is reflected from the body and produce a sensor signal.

15. (Original) The electronic device of claim 14, further comprising:
a processing unit configured to compute a health metric associated with the user based on the sensor signal; and
a display disposed within the housing and configured to display the health metric

16. (Original) The electronic device of claim 12, wherein the biosensor module is removably coupled to the housing.

17. (Original) A wearable electronic device, comprising:

a housing comprising:
a top portion;
a cavity formed within the top portion; and
a curved side portion that surrounds the cavity; and
a transparent cover disposed over the cavity of the housing and comprising:
a flat middle portion at a center of the transparent cover;
a curved outer portion that emanates from and surrounds the flat middle portion and extends outwardly to an edge of the transparent cover; and
a mask positioned relative to an internal surface of the transparent cover, wherein the mask has an outer boundary located proximate to the edge of the transparent cover and an inner boundary located within the curved outer portion of the transparent cover.

18. (Original) The wearable electronic device of claim 17, further comprising:
a display disposed below the transparent cover, wherein a perimeter portion of a viewable area of the display is disposed below the mask.

19. (Original) The wearable electronic device of claim 17, wherein the device further comprises:
an antenna having a shape that corresponds to a shape of the cavity formed within the housing, wherein:
the antenna is disposed in a groove formed in the internal surface of the transparent cover; and
the groove is formed between the outer boundary and the inner boundary of the mask.

20. (Original) The wearable electronic device of claim 19, wherein:
the cover is formed from a sapphire material; and
the antenna is configured to facilitate wireless communication between the wearable electronic device and an external device.

21-34. (Cancelled)

REMARKS

This Amendment is being submitted in order to amend the "Cross-Reference to Related Applications" paragraph of the specification and to cancel originally filed claims 21-34. No new matter is added by these amendments.

The Assignee believes no fees or petitions are due with this filing. However, should any such fees or petitions be required, please consider this a request therefor and authorization to charge Deposit Account No. 504621 as necessary.

If the Examiner should require any additional information or amendment, please contact the undersigned attorney.

Dated: September 10, 2016

Respectfully submitted,

/Elissa A. Asaro/
Elissa A. Asaro, Registration No. 64,659
Agent for Assignee
USPTO Customer No. 62579

Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, Colorado 80202
Phone: (303) 223-1100
Fax: (303) 223-1111

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	Not Yet Assigned
Filing Date	Herewith
First Named Inventor	Fletcher R. Rothkopf
Title	WEARABLE ELECTRONIC DEVICE
Art Unit	Not Yet Assigned
Examiner Name	Not Yet Assigned
Attorney Docket Number	P22914USC3

SIGNATURE of Applicant or Patent Practitioner			
Signature	/Elissa A. Asaro/	Date (Optional)	September 10, 2016
Name	Elissa A. Asaro	Registration Number	64,659
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)	Apple Inc.		
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.			
☒ *Total of <u>1</u> forms are submitted.			

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

- ☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

62579

OR

- ☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

Name	Registration Number	Name	Registration Number

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

- ☒ The address associated with the above-mentioned Customer Number.

OR

- ☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant:

- ☐ Inventor or Joint Inventor
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature

Name

Title and Company

Date

Telephone

9/27/14

408 974-0015

BJ Watrous

Vice President and Chief IP Counsel, Apple Inc.

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below *.

- ☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		WEARABLE ELECTRONIC DEVICE		
First Named Inventor/Applicant Name:		Fletcher R. Rothkopf		
Filer:		Elissa A. Asaro		
Attorney Docket Number:		P22914USC3		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Utility application filing	1011	1	280	280
Utility Search Fee	1111	1	600	600
Utility Examination Fee	1311	1	720	720
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1600

Electronic Acknowledgement Receipt	
EFS ID:	26888697
Application Number:	15261917
International Application Number:	
Confirmation Number:	4481
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Elissa A. Asaro
Filer Authorized By:	
Attorney Docket Number:	P22914USC3
Receipt Date:	10-SEP-2016
Filing Date:	
Time Stamp:	17:30:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$1600
RAM confirmation Number	7672
Deposit Account	504621
Authorized User	ASARO, ELISSA
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 CFR 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 CFR 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 CFR 1.19 (Document supply fees)					
Charge any Additional Fees required under 37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	P22914USC3UtilityPatentApplicationTransmittal.pdf	179453	no	2
			ebboe069e7786d4e777260af9e8aa45a5cf68d228		
Warnings:					
Information:					
2	Application Data Sheet	P22914USC3ApplicationDataSheet.pdf	104073	no	7
			7a1084545d4b421c3f5a0241a65f9a37f630621		
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
3		P22914USC3ContinuationPatentApplication.pdf	444749	yes	97
			9f6056feca018ffc9ae25f4a3bfc38212d082edc		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	88	
	Claims		89	96	
	Abstract		97	97	
Warnings:					
Information:					
4	Drawings-only black and white line drawings	P22914USC3FormalDrawings.pdf	298249	no	26
			2a523c37c6c6f57c5194bf2a990793a610bf18fc		
Warnings:					
Information:					

5	Oath or Declaration filed	P22914USC3DeclarationRothko pf.pdf	1069130	no	1
			209a7a46f778519392c5cea59b75060ae39 90b7b		
Warnings:					
Information:					
6	Preliminary Amendment	P22914USC3PreliminaryAmend ment.pdf	36638	no	7
			cd0a76d9d19fb10624a7b9974a6aee003b7 cc1ed		
Warnings:					
Information:					
7	Transmittal Letter	P22914USC3TransmittalofPOA. pdf	95557	no	1
			adb2ed355d7b18f10d52919d202baf3f48b b5f4b		
Warnings:					
Information:					
8	Power of Attorney	P22914USC3ExecutedPOAbyA pplicant.pdf	207000	no	1
			540d453159414cd7cb0654a86a8d2d6fd6b 67b77		
Warnings:					
Information:					
9	Fee Worksheet (SB06)	fee-info.pdf	35000	no	2
			988c2084050b011f3008105dab267bd0107 047f5		
Warnings:					
Information:					
Total Files Size (in bytes):			2469849		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 15/261,917		Filing Date 09/10/2016		☐ To be Mailed	
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO									
APPLICATION AS FILED – PART I									
(Column 1)		(Column 2)							
FOR	NUMBER FILED	NUMBER EXTRA		RATE (\$)	FEE (\$)				
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A					
☐ SEARCH FEE (37 CFR 1.16(k), (j), or (m))	N/A	N/A		N/A					
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A					
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		X \$ =					
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		X \$ =					
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL					
APPLICATION AS AMENDED – PART II									
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT	09/10/2016	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X \$80 =	0		
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X \$420 =	0		
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE		0	
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =			
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =			
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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