

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
2 May 2008 (02.05.2008)

PCT

(10) International Publication Number
WO 2008/051930 A2

(51) International Patent Classification:
E05B 25/08 (2006.01)

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(21) International Application Number:
PCT/US2007/082139

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(22) International Filing Date: 22 October 2007 (22.10.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/853,888 23 October 2006 (23.10.2006) US
60/909,867 3 April 2007 (03.04.2007) US
60/940,318 25 May 2007 (25.05.2007) US

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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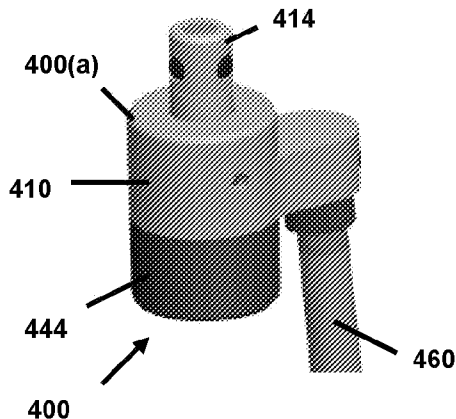
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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Published:
— without international search report and to be republished upon receipt of that report

(54) Title: SECURITY APPARATUS



(57) Abstract: A security apparatus is disclosed. The security apparatus is used with a lock interface member attached to a housing of a portable electronic device. The security apparatus may include a head comprising a plurality of engagement elements adapted to engage the lock interface member via the engagement regions, where the engagement elements are capable of extending radially outward to engage the engagement regions of the interface member.

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SECURITY APPARATUS

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application is a non-provisional of and claims the benefit of the filing dates of the following U.S. provisional patent applications: 60/853,888, filed on October 23, 2006; 60/909,867, filed on April 3, 2007, and 60/940,318, filed on May 25, 2007, which are herein incorporated by reference in their entirety for all purposes.

BACKGROUND

[0002] Embodiments of the present invention relate to devices for inhibiting the theft of relatively small but expensive pieces of equipment.

[0003] Computers have evolved rather rapidly from large, expensive machines usable only by a few, to relatively small, portable machines which are usable by many. In particular, the development of personal computers with significant processing power has made computers available to the general population. It is now common for college and even high school students to have their own computer, and personal computers are in wide spread use as word processors and work stations in almost all forms of business. Personal computers are relatively small and easily transportable, and an undesirable side effect of their proliferation is the fact that the theft of such computers is a significant problem.

[0004] A variety of devices have been developed to inhibit the theft of personal computers and similar equipment. Since personal computer systems involve several components, typically including the computer itself, a separate monitor, keyboard and often a printer, such security systems often employ a cable which attaches each of the components to each other and to a relatively immovable object such as a desk. The principal difficulty in such systems is providing an effective and convenient method for attaching the cable itself to the equipment.

[0005] One way to address the problem of computer security is to provide a small, generally rectangular slot in a wall of a computer. A security apparatus with a locking head may be secured to the computer via the rectangular slot.

[0006] While the conventional rectangular slot solution is effective, improvements could be made. For example, although thieves are deterred from stealing portable computers secured by conventional security mechanisms, in some cases, such thieves may be more interested in the data stored in the computers rather than the computers themselves.

5 Accordingly, the damage that may occur to a computer that may occur during the theft of the computer may not deter a thief who wants the data stored inside of the computer. It would be desirable to improve the strength of the physical coupling between the security apparatus and the computer and so that it is more difficult for potential thieves to separate the security apparatus from the computer.

10 **[0007]** Embodiments of the invention address these and other problems, individually and collectively.

BRIEF SUMMARY

[0008] Embodiments of the invention are directed to security apparatuses, systems, and methods for using such security apparatuses. Other embodiments of the invention may
15 be directed to lock interface members and systems and methods incorporating such lock interface members.

[0009] One embodiment of the invention is directed to a security apparatus for use with a lock interface member comprising an aperture and engagement regions. The security apparatus comprises a head comprising a plurality of engagement elements adapted to engage
20 the lock interface member via the engagement regions. The engagement elements are capable of extending radially outward to engage the engagement regions. A security device is coupled to the head.

[0010] Another embodiment of the invention is directed to a system comprising a portable electronic device comprising a lock interface member having an aperture and
25 engagement regions, and a security apparatus for use with the lock interface member. The security apparatus comprises a head comprising a plurality of engagement elements adapted to engage the lock interface member via the engagement regions. The engagement elements are capable of extending radially outward to engage the engagement regions.

[0011] Another embodiment of the invention is directed to a method for securing the
30 above-described security apparatus to the lock interface member. The method comprises: (a) inserting engagement elements into the aperture of the lock interface member; and (b)

pushing the engagement elements radially outward so that the engagement elements engage the lock interface member.

[0012] Another embodiment of the invention is directed to a security apparatus comprising a head comprising a plurality of elongated engagement elements adapted to engage an aperture in a lock interface member in a portable electronic device. The security apparatus comprises a rotatable spindle comprising a plurality of bumps, and a locking mechanism. The bumps on the spindle are configured to push the elongated engagement elements radially outward when the spindle is rotated, and a security device attached to the head.

[0013] Another embodiment of the invention is directed to a system comprising a portable electronic device, an aperture associated with a lock interface member in the portable electronic device, and a security apparatus. The security apparatus comprises a head comprising a plurality of elongated engagement elements adapted to engage the aperture, a rotatable spindle comprising a plurality of bumps, and a locking mechanism. The bumps on the spindle are configured to push the elongated engagement elements radially outward when the spindle is rotated.

[0014] Another embodiment of the invention is directed to a method for using the above-described security apparatus. The method comprises: (a) inserting the plurality of elongated engagement elements into the aperture; (b) rotating the spindle; (c) extending the elongated engagement elements radially outward; and (d) locking the head.

[0015] These and other embodiments of the invention are described in further detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 shows a perspective view of a portable electronic device and a security apparatus.

[0017] FIG. 2(a) shows a portion of a wall of a portable electronic device and another lock interface member.

[0018] FIG. 2(b) shows a perspective view of a portion of another security apparatus according to an embodiment of the invention.

[0019] FIG. 2(c) shows a perspective view of the portion of the security apparatus shown in FIG. 2(b), as a portion of a head is inserted through an aperture in the wall of a portable electronic device and an aperture in the lock interface member. The engagement elements are in the form of balls and they are not yet engaged with the lock interface member. A portion of the lock interface member and the wall are cut away.

[0020] FIGS. 2(d) and 2(e) are views that are similar to the view in FIG. 2(c), except that the balls are engaged to the lock interface member.

[0021] FIG. 2(f) shows a cross-sectional view of a portion of the balls as they are present in the lock interface member.

[0022] FIG. 2(g) shows a perspective view of a security apparatus comprising balls, wherein the balls are not engaged to a lock interface member attached to a wall of a portable electronic device.

[0023] FIG. 2(h) shows a cross-sectional view of a portion of the balls as they are in a withdrawn position and are not engaged to the lock interface member.

[0024] FIG. 2(i) shows an exploded view of the security apparatus shown in FIG. 2(a), along with other components.

[0025] FIG. 2(k) is a front view of another lock interface member according to an embodiment of the invention.

[0026] FIG. 2(l) is a side, cross-sectional view of the lock interface member shown in FIG. 2(k).

[0027] FIG. 2(m) is a perspective view of the lock interface member shown in FIG. 2(k).

[0028] FIG. 3(a) shows a perspective view of a wall of a housing of a portable electronic device and an aperture in the wall. A security apparatus comprising a head according to another embodiment of the invention is also shown.

[0029] FIG. 3(b) shows a perspective view of the head shown in FIG. 3(a) where engagement elements of the security device do not engage the wall.

[0030] FIG. 3(c) shows a perspective view of the head shown in FIG. 3(c) where the engagement elements do engage the wall.

[0031] FIG. 3(d) shows a perspective side view of the head shown in FIG. 3(a), where a portion of the head and the wall are cut away. The engagement elements engage the wall.

[0032] FIG. 3(e) shows a perspective side view of the head shown in FIG. 3(a), where a portion of the head and the wall are cut away. The engagement elements do not engage the wall.

[0033] FIG. 3(f) shows an exploded view of another head according to another embodiment of the invention.

[0034] FIG. 4(a) is a system comprising a security apparatus of the type shown in FIGS. 3(a)-3(f) and a lock interface member.

10 [0035] FIG. 4(b) shows the system in FIG. 4(a) wherein engagement elements and a stabilizing element are inserted into an aperture in the lock interface member, but the engagement elements are not yet engaged to the lock interface member.

[0036] FIG. 4(c) shows the system in FIG. 4(a) wherein engagement elements and a stabilizing element are inserted into an aperture in the lock interface member, wherein the engagement elements are engaged to the lock interface member.

15 [0037] In the Figures, like numerals designate like elements.

DETAILED DESCRIPTION

[0038] Embodiments of the invention are directed to security apparatuses, methods for using security apparatuses, and systems using such security apparatuses. The security apparatuses can be used to prevent or deter the theft of devices such as portable electronic devices.

[0039] In addition, in embodiments of the invention, a lock interface member may be used to enhance security and to improve the strength of the coupling between a portable electronic device and a security apparatus. The lock interface member may be an attachment that may be attached to the housing of the portable electronic device, or it may be integrally formed in the housing or other component of the portable electronic device. For example, in some embodiments, the lock interface member may be integrally formed with (e.g., a wall portion of a wall or chassis portion of a chassis, and the lock interface member may be formed from the same material without an interface), or operatively or physically coupled to

the chassis of the portable electronic device and/or may be operatively or electrically coupled to some electrical component (e.g., a memory chip, disk drive, or microprocessor) in the portable electronic device. In addition, if the lock interface member is a separate component from the wall of the portable electronic device, the lock interface member may be positioned within an aperture formed in a wall of the portable electronic device, or inside of the portable electronic device. Exemplary lock interface members are described in further detail below.

[0040] By using a lock interface member, the strength of the coupling between the security apparatus and the lock interface member is increased over a conventional physical security system including a portable electronic device comprising only a 3 x 7 mm² security slot and a physical security apparatus secured to the portable electronic device via the security slot. A conventional security system such as this can withstand 150 lbs of force, because the plastic housing of the portable consumer device can fail or break when this magnitude of force is applied. Also, current locks on the market are designed to withstand 300 lbs of force before they are broken. Further, the ability to "torque" the conventional security apparatus out of a security slot is also of concern. Improved security apparatuses and systems are therefore desirable.

[0041] Using embodiments of the invention, the strength of the coupling between the security apparatus and the portable electronic device may be increased by at least 2, 6, or even 8 times compared to conventional systems. For example, by using embodiments of the invention, it may take more than about 300 lbs of force, or even more than about 500, 1000, or 2000 lbs of force to break the physical coupling between the head in a security apparatus and the lock interface member associated with the portable electronic device to which it is secured. As shown below, the engagement elements and stabilizing elements are preferably cooperatively structured with the internal surfaces of the lock interface member. The potential contact area between the engagement element and the inner surfaces of the lock interface member is more than in a conventional locking system. For example, in some embodiments, the contact area between the lock interface member and parts of a corresponding locking head can be at least about 5 times greater than conventional security systems. This increased contact area can also provide for better load distribution when stresses are applied to mating surfaces. The engagement elements and the stabilizing elements are also stronger than conventional elements in conventional locks, and weak links are reduced as compared to conventional security systems. Accordingly, embodiments of the

invention are stronger and therefore more effective at deterring and preventing the theft of portable electronic devices than conventional security systems.

[0042] A security apparatus according to an embodiment of the invention may comprise a head and a security device. The head and the security device may be physically and/or operationally coupled together.

[0043] The security device may comprise a cable, or some other type of device to provide security. If the security device comprises a cable, then the cable may be secured to an immovable object such as a desk or cabinet so that a portable electronic device coupled to the cable cannot be removed. The cable may comprise stainless steel, Kevlar[®], or some other type of strong material.

[0044] In another embodiment, the security device may comprise a wireless device such as a wireless transmitter and/or receiver. The wireless device may be used in a proximity detection system or a motion detection system. For example, a motion detector could be present in the wireless device so that when the motion detector moves, an associated alarm is triggered. The alarm may be in the security device or may be external to the security device. In another embodiment, there may be a base device associated with the wireless device, and these components may be used in a proximity detection system. Wireless signals may be transmitted between the security device and the base device, and when these devices are separated by a predetermined distance, an associated alarm (e.g., an audible alarm) may be triggered. The alarm could be in the base device or in the security device. The electronics associated with such wireless systems are known to those of ordinary skill in the art.

[0045] The head in the security apparatus may be a locking head. A locking head according to an embodiment of the invention may comprise a locking mechanism such as a key locking mechanism or a combination locking mechanism disposed within a locking head housing. Various types of locking heads are described in further detail below.

[0046] The portable electronic device that is to be secured may comprise any suitable device. Examples of such devices comprise portable computers such as laptop, desktop, and server computers, flat panel televisions, projectors, monitors, portable music players, printers, external hard-drives, cell phones, etc.

[0047] The parts of the locking head and/or the lock interface member may be made of any suitable material, and may be formed in any suitable manner. Suitable materials

include materials such as stainless steel, nickel alloys, etc. They can be formed by machining, molding, etc.

[0048] As used herein, in the above described embodiments and in other embodiments, an “aperture” may include a blind aperture or a through aperture. A through aperture may be in the form of a hole, or a recess. Apertures according to embodiments of the invention can be of any suitable size, but preferably have dimensions less than about 10 mm in some embodiments.

[0049] FIG. 1 shows a system comprising a portable electronic device **30** and a security apparatus **26** that is used to secure the portable electronic device **30** to an immovable object **10** such as a desk leg or the like. The security apparatus **26** comprises a head **28** and a cable **32** coupled to the head **28**, which may be a locking head in this example. A loop **34** is at a terminal end of the head **28**. The cable **32** may comprise a strong material such as stainless steel or Kevlar™.

[0050] To secure the portable electronic device **30** to the immovable object, the cable **32** may be wrapped around the immovable object and the head **28** may pass through the loop **34**. An engagement element in the head **28** may then be inserted into an aperture in the portable electronic device **30**, or in an aperture in a lock interface member that is associated with the portable electronic device **30**. Before, during, or after this, a stabilizing element may then be inserted into the aperture in the lock interface member to stabilize the head **28** so that the engagement element cannot be readily withdrawn from the aperture. A locking mechanism such as a key locking mechanism or a combination locking mechanism may be used to keep the stabilizing element and/or the engagement element from moving or not moving.

[0051] An embodiment of the invention can be directed to a security apparatus for use with a lock interface member comprising an aperture and engagement regions. The security apparatus comprises a head comprising a plurality of engagement elements adapted to engage the lock interface member via the engagement regions, wherein the engagement elements are capable of extending radially outward to engage the engagement regions. The engagement regions may be structurally discrete or non-discrete regions. For example, in some cases, the engagement regions may be a single curved surface with areas for engagement by many engagement elements. A security device may be coupled to the head.

[0052] FIG. 2(a) shows a lock interface member **402** attached to the inner surface of a wall **404**. The wall **404** may be part of a housing of a portable electronic device (not shown). In this example, the lock interface member **402** is circular or disk-shaped.

[0053] A security apparatus **400** that can be used with the lock interface member **402** is shown in FIG. 2(b). The security apparatus **400** comprises a head **400(a)** attached to a cable **460**. The head **400(a)** includes a cable ring **410** and a body **444** which may form a housing as in other embodiments of the invention.

[0054] As shown in FIG. 2(c), the head **400(a)** comprises a post **414** which may include a spring clip **414(a)**. The post **414** may be considered a stabilizing element. The post **414** may be inserted into the aperture in the lock interface member **402** as shown in FIG. 5(c). In this example, the aperture in the lock interface member **402** is in the form of the through aperture. At this point, balls **406** in the post **414** are retracted.

[0055] As shown in FIG. 2(d), a key (not shown) may be inserted into a keyway at the rear of the head **400(a)** and may then be turned. The turning of the key may cause the balls **406** to extend radially outward so that corresponding inner recesses **402(a)** in the lock interface member **402** are engaged by the balls **406**. The balls **406** may be characterized as engagement elements in some cases, and the recesses **402(a)** may be characterized as discrete engagement regions in other embodiments.

[0056] FIG. 2(e) is a partial cut away view showing balls **406** in inwardly facing recesses **402(a)** in the lock interface member **402(a)**. A spindle **408** can rotate and can cause the balls **406** to extend radially outward. As shown in FIG. 2(f), a terminal end of the spindle **408** may resemble a triangle with curved sides. The corners of the triangle may be considered raised portions and may push the balls **406** radially outward when the head **400(a)** transitions from an unlocked configuration to a locked configuration.

[0057] FIG. 2(g) shows a partial cut away view showing balls **406** withdrawn into recesses **408(a)** in the terminal end **408(b)** of the spindle **408**. As shown in FIG. 2(h), the balls **406** are in recesses **408(a)** at the terminal end of the spindle **408**. The head is thereafter in an unlocked configuration, and as shown in FIG. 2(h), the balls **406** do not contact engagement regions in the lock interface member **402**.

[0058] FIG. 2(i) shows an exploded view of the security apparatus shown in FIG. 2(b). In FIG. 2(i), a body **444** is cylindrically shaped, and has at least one aperture **444(a)**.

The aperture **444(a)** can align with aperture **410(a)** in the cable ring **410** and aperture **412(c)** in a spindle holder **412**. As in prior embodiments, the cable ring **410** has a ferrule holder **430** and a ferrule **432** attached to it.

[0059] The spindle holder **412** comprises a plate portion **412(a)**, which is shaped like a disk at end, and an apertured portion **412(b)** at another end. An axial passage **412(d)** runs axially through the spindle holder **412**.

[0060] Three balls **406** (e.g., steel ball bearings) may be sandwiched between the apertures in the apertured portion **412(b)** of the spindle holder **412** and a retainer clip **414(a)** having corresponding apertures. The apertures in the retaining clip **412** (or spring clip) and the apertured portion **412(b)** of the spindle holder **412** may radially overlap, and may have diameters that are smaller than the diameters of the balls **406**. The retaining clip **412** can flex or is resilient so that the balls **406** can extend radially outward or retract radially inward while being retained between the retaining clip **412** and the apertured portion **412(b)** in fixed axial positions.

[0061] The head in the security apparatus shown in FIG. 2(i) includes a locking mechanism which may comprise a first cylinder **420** and a second cylinder **422**. The first cylinder **420** and a second cylinder **422**, with other components, may form parts of a locking mechanism. The first cylinder **420** may include a first plurality of axial holes which may receive driver pins (not shown) and springs (not shown), while the second cylinder **422** may include a second plurality of axial holes in a rear portion **422(a)** which may receive key pins (not shown). The second cylinder **422** may also comprise a front portion **422(b)** which may have a smaller diameter than the rear portion **422(b)**. The second cylinder **422** may rotate relative to the first cylinder **420** when a key is inserted through a keyway at a rear of the second cylinder **422** and turned. The key pins may be driven inward different lengths by a key (not shown) with so that no pins lay across a shear line between the first cylinder **420** and the second cylinder **422**.

[0062] Another pin **424** passes through a radially extending hole **422(b)-1** and is inserted in hole **408(b)-1** in the spindle **408**, so that the spindle **408** is coupled to the second cylinder **422**. As shown, the spindle **408** includes a rear portion **408(b)** and a front portion **408(a)**. The rear portion **408(b)** engages the second cylinder **422**, while the front portion **408(a)** engages and manipulates balls **406**.

[0063] A lock interface member **402** is also shown in FIG. 2(i). The details of this particular lock interface member **402** are provided below.

[0064] Referring to FIG. 2(i), in use, a key (not shown) may be inserted into a keyway in the second cylinder **422**, and may be turned, for example, clockwise. The second cylinder **422(a)** can thereafter turn the spindle **408**, and the raised portions at the front portion **408(a)** of the spindle pushes the balls **406** radially outward to engage the lock interface member **402**. The balls **406** are held in fixed axial positions. The key is withdrawn and the head is thereafter in a locked configuration.

[0065] To unlock the head, the key is inserted into the keyway in the second cylinder **422** and may be turned, for example, counter clockwise. The spindle **408** may then turn, thereby causing the balls **406** to retract into recesses at the terminal end of the spindle **408**. Once the balls **406** retract, the balls **406** and therefore the head disengage from the lock interface member **402** and the head can be withdrawn from the lock interface member **402**.

[0066] FIGS. 2(k)-2(m) show different views of the previously described lock interface member **402**. Exemplary dimensions of the parts of the lock interface member **402** are shown in FIG. 2(k) in millimeters. As shown in FIG. 2(k), the lock interface member **402** comprises a tab **402(c)** attached (*e.g.*, integrally attached) to a ring **402(b)**. As shown in FIG. 2(l), the tab **402(c)** is oriented perpendicular to the ring **402(b)**, and has a hole **402(c)-1**. The ring **402(b)** has an inner rim **402(b)-2**, an outer edge portion **402(b)-1**, and an axially extending inner portion **402(b)-3**. The previously described balls can engage the rim **402(b)-2**, which may be a continuous, curved surface as shown in FIG. 2(l). In other embodiments, the rim may have a more abrupt surface. The rim **402(b)-2** may comprise a plurality of engagement regions, even though it is a continuous surface. FIG. 2(m) shows a perspective view of the lock interface member **402**.

[0067] Another embodiment of the invention is directed to a security apparatus comprising a head comprising a plurality of elongated engagement elements adapted to engage an aperture in a lock interface member in a portable electronic device. The security apparatus comprises a rotatable spindle comprising a plurality of bumps, and a locking mechanism. The bumps on the spindle are configured to push the elongated engagement elements radially outward when the spindle is rotated, and a security device attached to the head.

[0068] FIG. 3(a) shows an embodiment of the invention of this type. FIG. 3(a) shows a security apparatus **500** comprising a head **500(a)**. The head **500(a)** comprises a body **510**, a cable ring **526**, and an engagement arm housing **522** with a front portion **522(a)** which is cooperatively structured with an aperture **508(a)** in a wall **508** of a portable electronic device (not shown here, but shown in other Figures). These components may form a housing for the head **500(a)**. The engagement arm housing **522** houses four engagement arms **524(a)** which are spaced at regular radial positions (e.g., 12, 3, 6, and 9 o'clock). The engagement arms **524(a)** surround a front portion **518(b)** of a spindle, and may comprise flanges.

[0069] Referring to FIG. 3(b), a portion of the engagement arm housing **522** is inserted into the aperture **508(a)** of the wall **508** of the portable electronic device. The engagement arms **524(a)** are not yet radially extended and the head **500(a)** is in an unlocked configuration.

[0070] FIG. 3(c)-3(d) show the head **500(a)** after the head **500(a)** is changed to a locked configuration. The front portion **518(b)** of the spindle is rotated using a key (not shown), bumps **518(b)-1** on the engagement arms **524(a)** push the forward ends of the engagement arms **524** radially outward to engage the surface defining the aperture **508(a)** and the inner surface of the wall **508**. Each engagement arm **524** includes a flange that extends radially outward.

[0071] As shown in FIG. 3(d), the front portions of the engagement arms **524** extend radially outward when the head **500(a)** has a locked configuration. However, in the locked configuration, the rear portions of the engagement arms **524** have radially fixed positions in both the locked and unlocked configurations. The engagement arms **524** can be characterized as pivoting at their rear portions and may have separate pivot points. Pins **512(a)**, **512(b)** secure the body **510** to the engagement arm housing **522**.

[0072] FIG. 3(e) shows the head **500(a)** in an unlocked configuration. As shown, the engagement arms are positioned between the bumps **518(b)-1** so that they are retracted radially inward. The engagement arms **524** are no longer engaged with the wall of the portable electronic device, and the head **500(b)** can be separated from it.

[0073] FIG. 3(f) shows an exploded view of the previously described lock apparatus **500**. FIG. 3(f) shows a cylindrical body **510** comprising holes **512(a)**. Pins **512(a)**, **512(b)** secure the body **510** to the engagement arm housing **522**, which may be referred to as a collet housing in some cases. As described above, at least portions of the engagement arms **524** are

inside of the engagement arm housing **522**. Two retainer clips **520** are used to retain the ends of the engagement arms **524**.

[0074] A locking mechanism including a first cylinder **516** and a second cylinder **514** are disposed in the body **510**. The characteristics of the first and second cylinders **516**, **514** may be the same as the previously described first and second cylinders. In addition, the second cylinder has an elongated portion **514(b)** which couples to the rear portion **518(a)** of the spindle **518** using a pin **512(b)**.

[0075] As in prior embodiments, a ferrule holder **528** and a ferrule **530** are attached to the cable ring **526**. A snap ring **523** and an optional lock interface member **532** are also shown in FIG. 3(f). The lock interface member **532** may include or be in the form of a collar.

[0076] FIGS. 4(a)-4(c) are similar to FIGS. 4(a)-4(c), except that a lock interface member **534** is shown and used. The lock interface member **534** includes a ring **534(a)**, an inner rim, and a perpendicular tab **534(c)**. As shown, the flanges associated with the engagement arms **524** can engage the lock interface member **534**.

[0077] The lock interface member **534** comprises a ring portion **534(a)** including a rim **534(b)** which may be in the form of a continuous surface. A tab **534(c)** extends from the ring portion **534(a)** and is oriented perpendicular to the orientation of the ring portion **534(b)**. As in prior embodiments, the tab **534(c)** may be used to attach the lock interface member **534** to a structural component of the portable electronic device including the wall **599**.

[0078] Embodiments of the invention have a number of advantages. As shown above, some embodiments use a lock interface member which has multiple points of engagement with engagement elements in a locking head. This provides for a stronger connection between the locking head and a portable electronic device including the lock interface member. It also makes it more difficult to torque a head out of the interface member.

[0079] The above description is illustrative and is not restrictive. Many variations of the invention will become apparent to those skilled in the art upon review of the disclosure. The scope of the invention should, therefore, be determined not with reference to the above description, but instead should be determined with reference to the pending claims along with their full scope or equivalents.

[0080] One or more features from any embodiment may be combined with one or more features of any other embodiment without departing from the scope of the invention.

[0081] A recitation of "a", "an" or "the" is intended to mean "one or more" unless specifically indicated to the contrary.

5 **[0082]** All patents, patent applications, publications, and descriptions mentioned above are herein incorporated by reference in their entirety for all purposes. None is admitted to be prior art.

WHAT IS CLAIMED IS:

- 1 1. A security apparatus for use with a lock interface member comprising
2 an aperture and engagement regions, the security apparatus comprising:
3 a head comprising a plurality of engagement elements adapted to engage the
4 lock interface member via the engagement regions, wherein the engagement elements are
5 capable of extending radially outward to engage the engagement regions; and
6 a security device coupled to the head.
- 1 2. The security apparatus of claim 1 wherein the engagement elements
2 comprise balls.
- 1 3. The security apparatus of claim 1 wherein the head further comprises
2 a retaining element comprising a retainer clip, and wherein the retainer clip holds the balls in
3 a fixed axial position.
- 1 4. The security apparatus of claim 1 further comprising a spindle
2 comprising recesses defined by raised portions, wherein the raised portions are configured to
3 push the balls outward when the spindle is rotated to a locked position and wherein the
4 recesses are configured to receive the balls when the spindle is rotated to an unlocked
5 position.
- 1 5. The security apparatus of claim 1 further comprising a locking
2 mechanism comprising a first cylinder and a second cylinder in the head, wherein the second
3 cylinder is adapted to rotate relative to the first cylinder.
- 1 6. The security apparatus of claim 1 wherein the first and second
2 cylinders comprise a plurality of axially extending holes in the first cylinder and the second
3 cylinder, and pins in the axially extending holes.
- 1 7. The security apparatus of claim 1 wherein the head comprises a key
2 locking mechanism.

1 8. A system comprising:
2 a portable electronic device comprising a lock interface member having an
3 aperture and engagement regions; and
4 a security apparatus for use with the lock interface member, the security
5 apparatus comprising a head comprising a plurality of engagement elements adapted to
6 engage the lock interface member via the engagement regions, wherein the engagement
7 elements are capable of extending radially outward to engage the engagement regions.

1 9. The system of claim 8 wherein the portable electronic device
2 comprises a computer.

1 10. The system of claim 8 wherein the lock interface member is in the
2 form of a collar.

1 11. The system of claim 8 wherein the engagement regions are recesses
2 cooperatively structured with the engagement elements.

1 12. The system of claim 8 wherein the engagement elements comprise
2 balls.

1 13. A method for securing a security apparatus of claim 1 to the lock
2 interface member, the method comprising:
3 (a) inserting engagement elements into the aperture of the lock interface
4 member; and
5 (b) pushing the engagement elements radially outward so that the
6 engagement elements engage the lock interface member.

1 14. The method of claim 13 further comprising, turning a key and then
2 pushing the engagement elements radially outward.

1 15. The method of claim 13 wherein the security device comprises a cable
2 and a loop at an end of the cable, wherein the method further comprises:
3 wrapping the cable around an immovable object;
4 inserting the head into the loop; and
5 then performing (a) and (b).

1 16. A security apparatus comprising:
2 a head comprising a plurality of elongated engagement elements adapted to
3 engage an aperture in a portable electronic device or in a lock interface member in the
4 portable electronic device, a rotatable spindle comprising a plurality of bumps, and a locking
5 mechanism, wherein the bumps on the spindle are configured to push the elongated
6 engagement elements radially outward when the spindle is rotated; and
7 a security device attached to the head.

1 17. The security apparatus of claim 16 wherein the engagement elements
2 comprise flanges at the ends of the engagement elements.

1 18. A system comprising:
2 a portable electronic device;
3 an aperture associated with the portable electronic device; and
4 a security apparatus comprising a head comprising a plurality of elongated
5 engagement elements adapted to engage the aperture, a rotatable spindle comprising a
6 plurality of bumps, and a locking mechanism, wherein the bumps on the spindle are
7 configured to push the elongated engagement elements radially outward when the spindle is
8 rotated.

1 19. The system of claim 18 wherein the security apparatus further
2 comprises a cable coupled to the head.

1 20. The system of claim 18 wherein the cable comprises a loop at an end
2 of the cable.

1 21. The system of claim 18 wherein the portable electronic device
2 comprises a portable computer.

1 22. A method for using the security apparatus of claim 16, the method
2 comprising:

3 (a) inserting the plurality of elongated engagement elements into the
4 aperture;

5 (b) rotating the spindle;

6 (c) extending the elongated engagement elements radially outward; and

7 (d) locking the head.

1 23. The method of claim 22 wherein the method further comprises:

2 unlocking the head;

3 rotating the spindle in an opposite direction to the direction of rotation in (b);

4 retracting the elongated engagement elements radially inward.

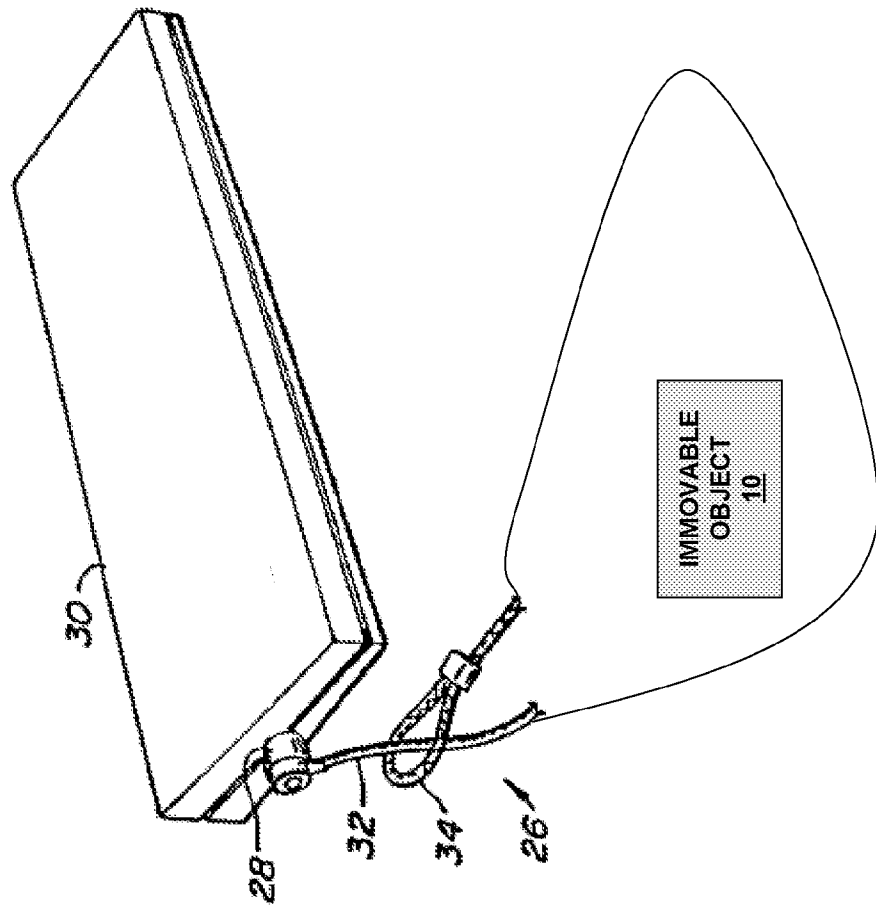
1 24. The method of claim 22 wherein the portable electronic device

2 comprises a portable computer.

1 25. The method of claim 22 wherein the head comprises a key locking

2 mechanism.

FIG. 1



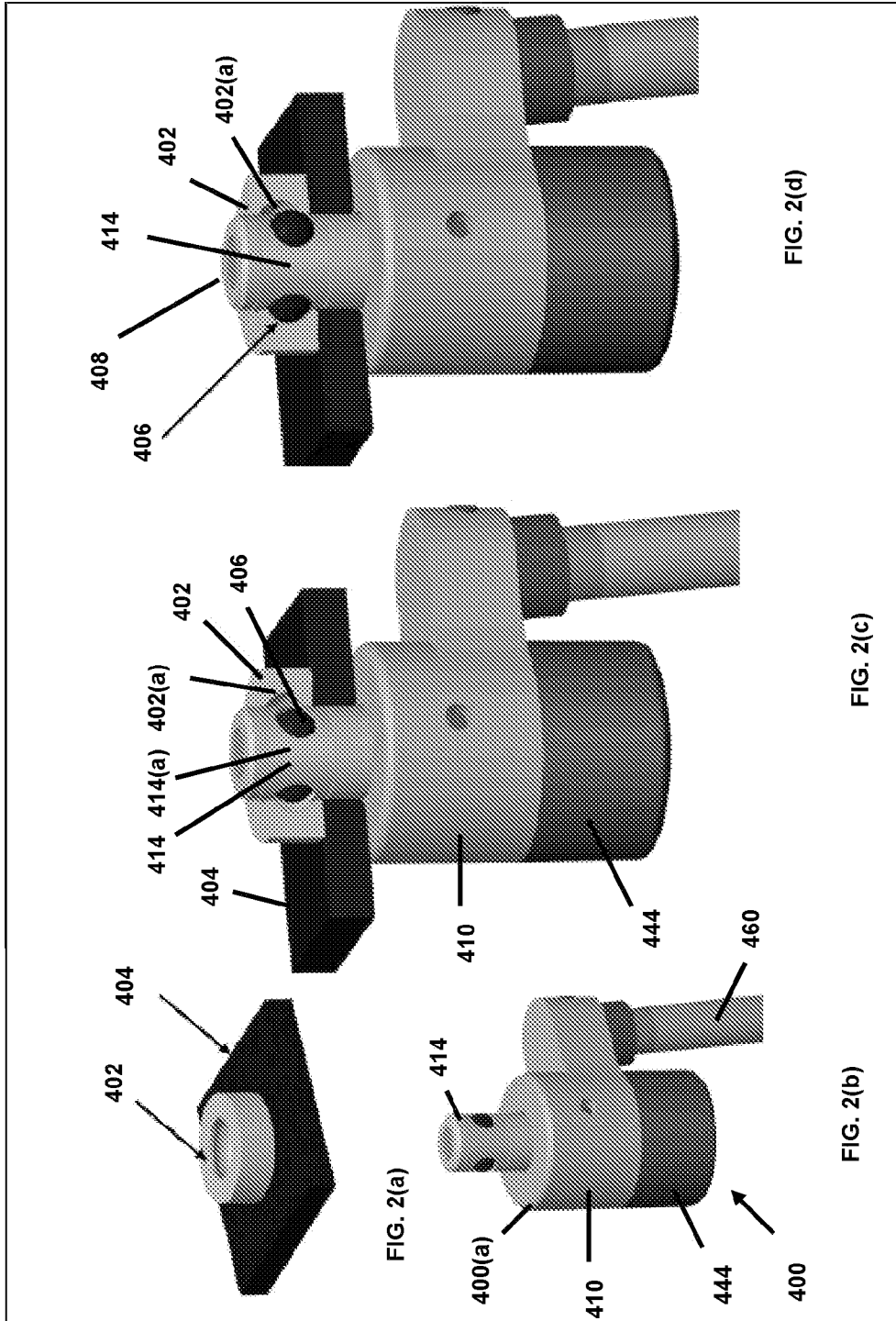


FIG. 2(d)

FIG. 2(c)

FIG. 2(b)

FIG. 2(a)

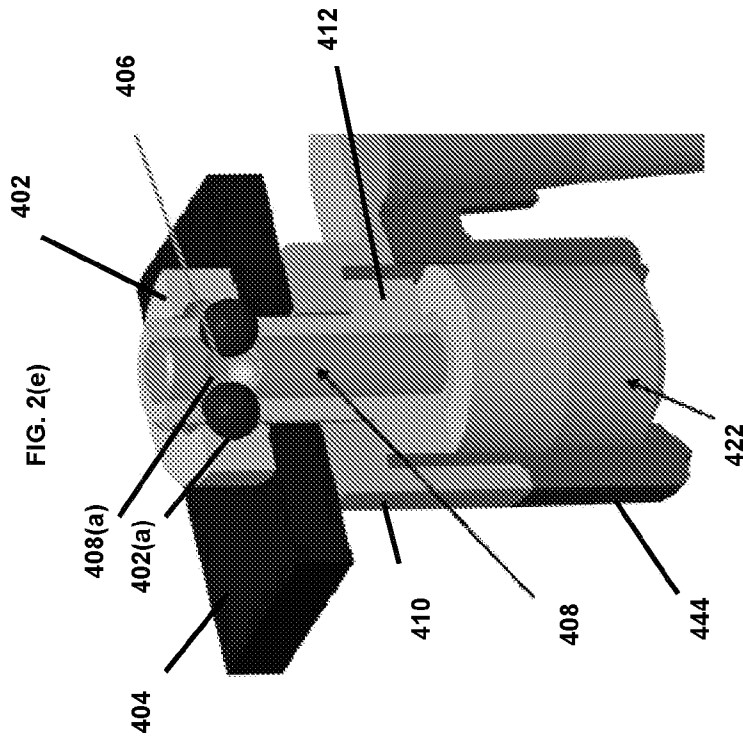


FIG. 2(e)

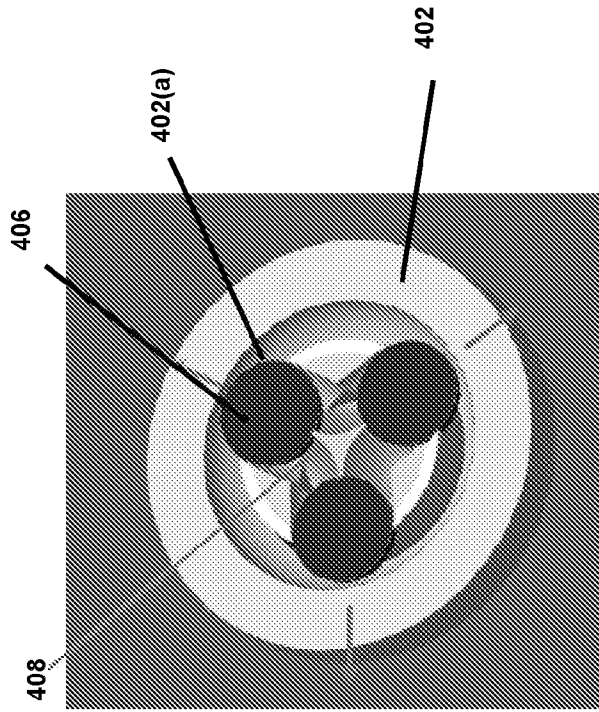
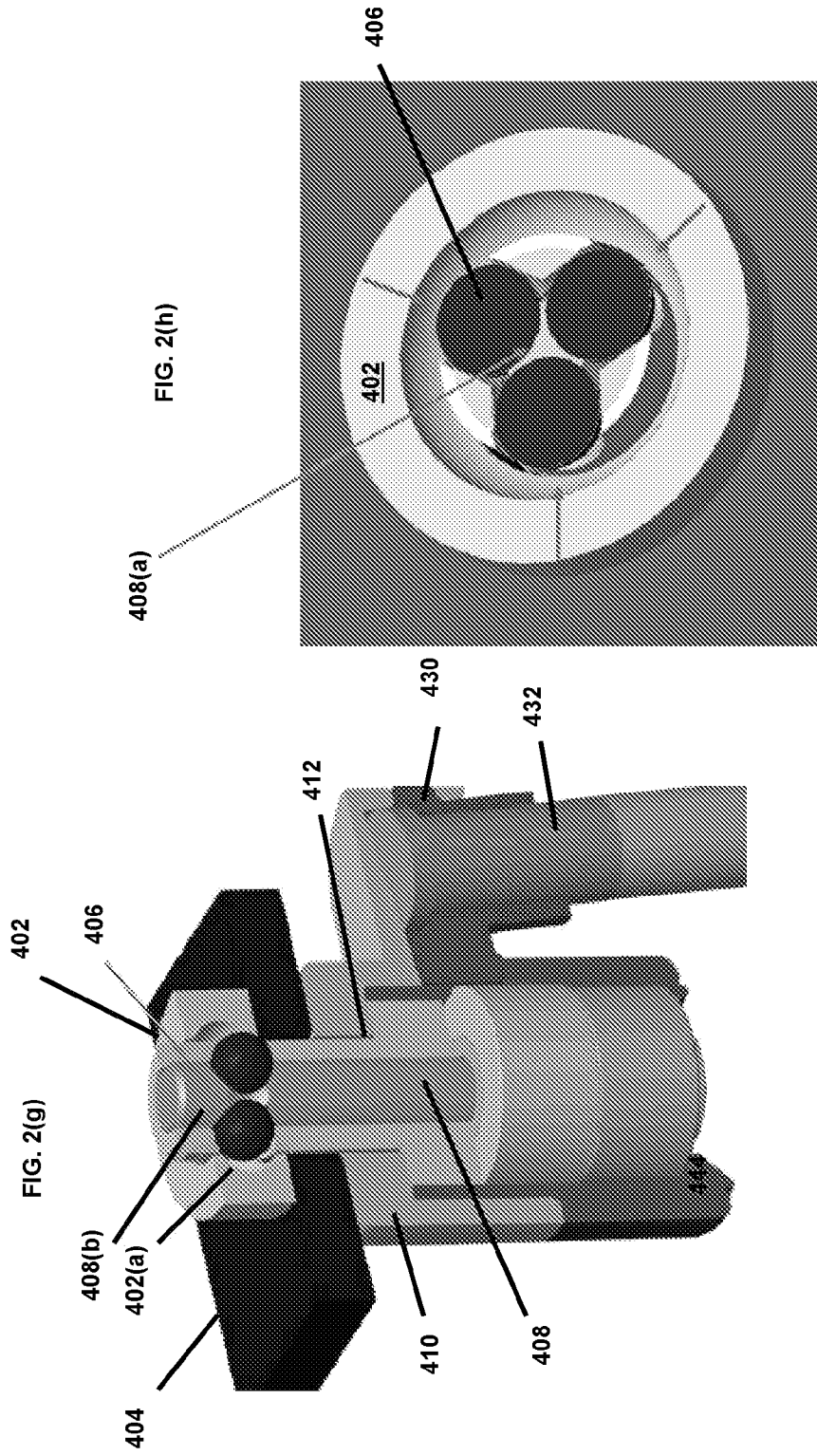
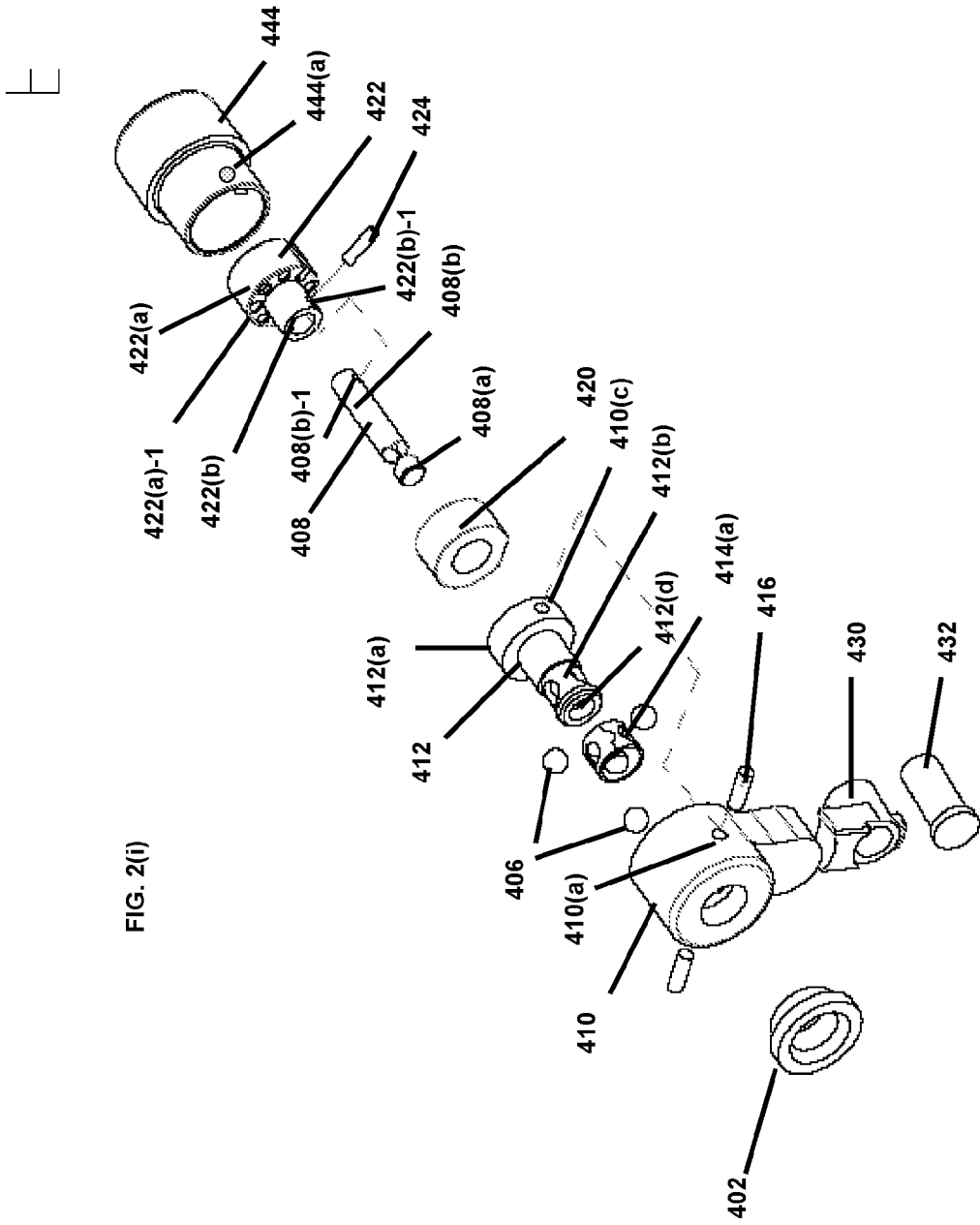
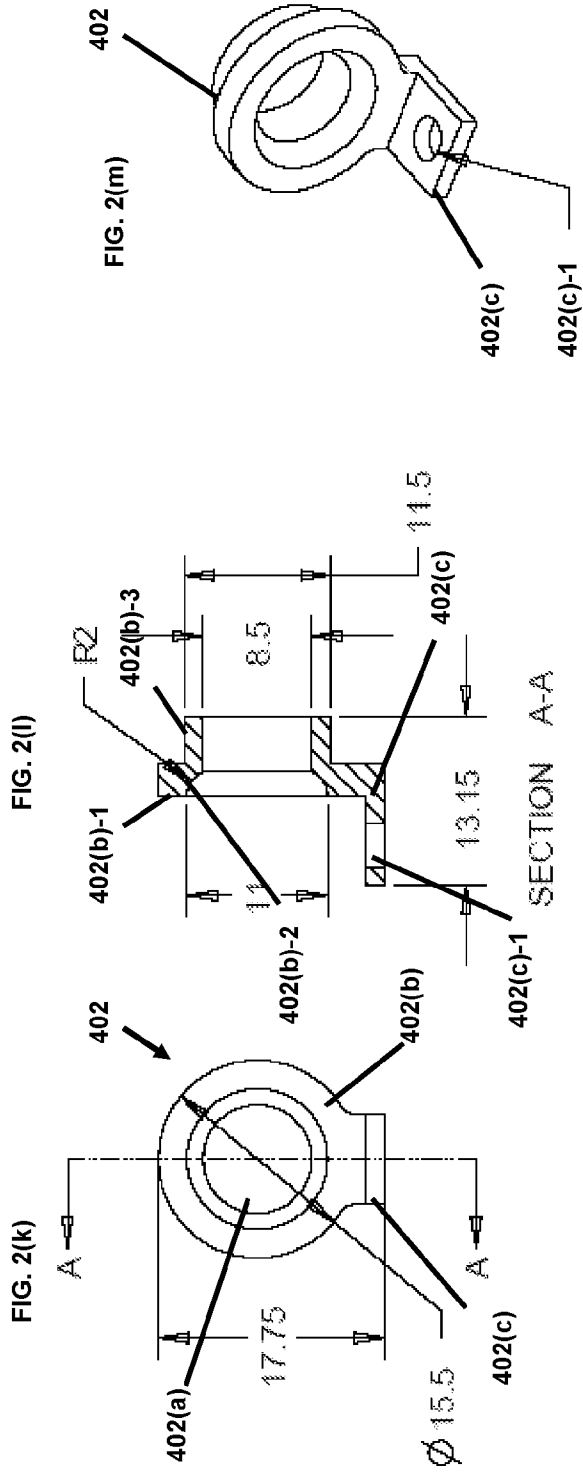


FIG. 2(f)







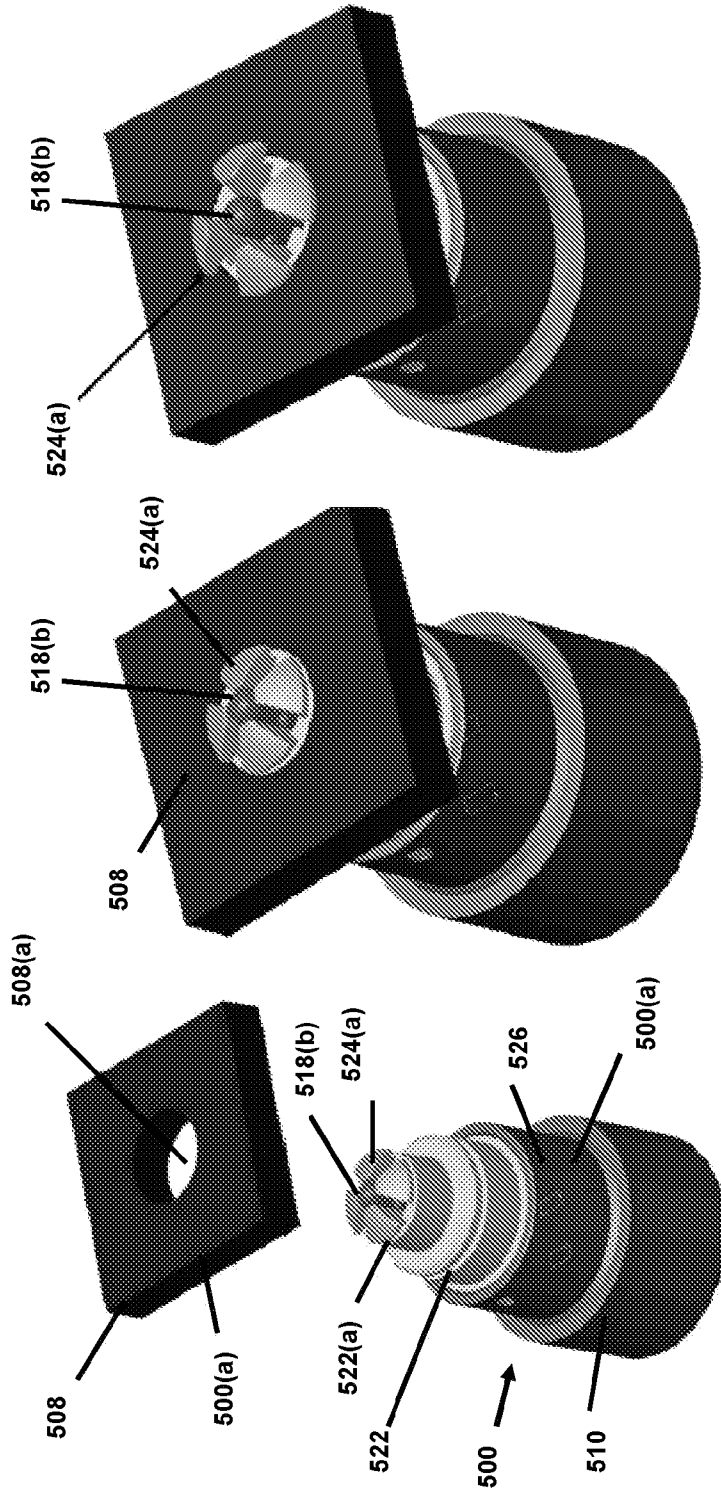


FIG. 3(a)

FIG. 3(b)

FIG. 3(c)

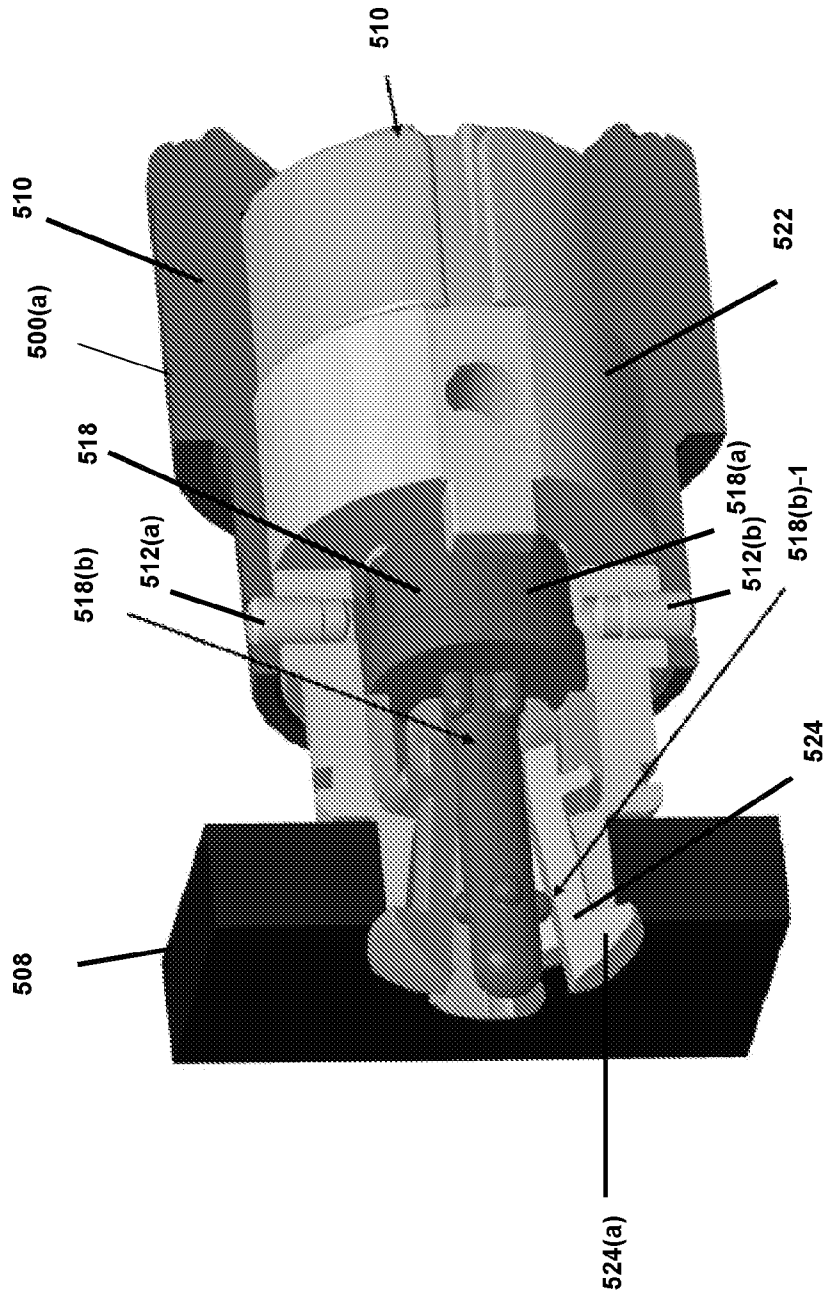


FIG. 3(d)

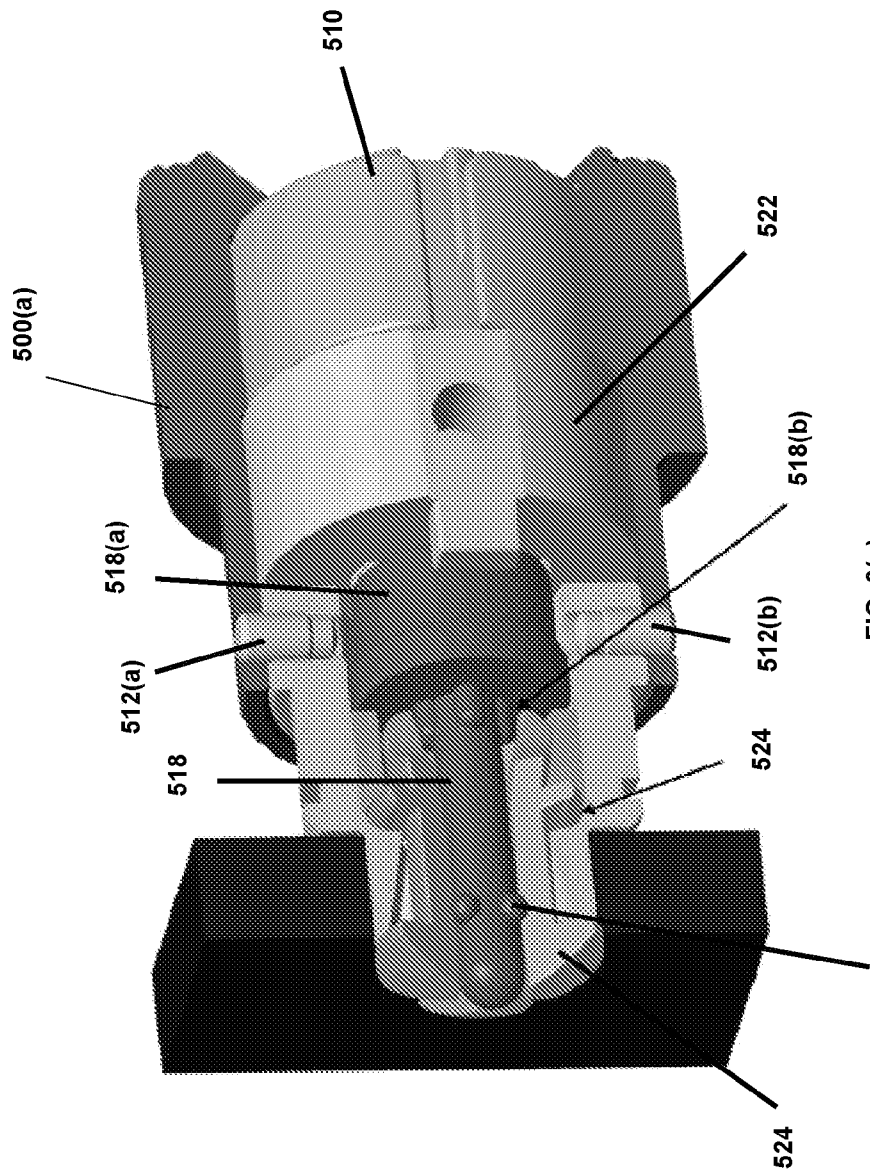


FIG. 3(e)

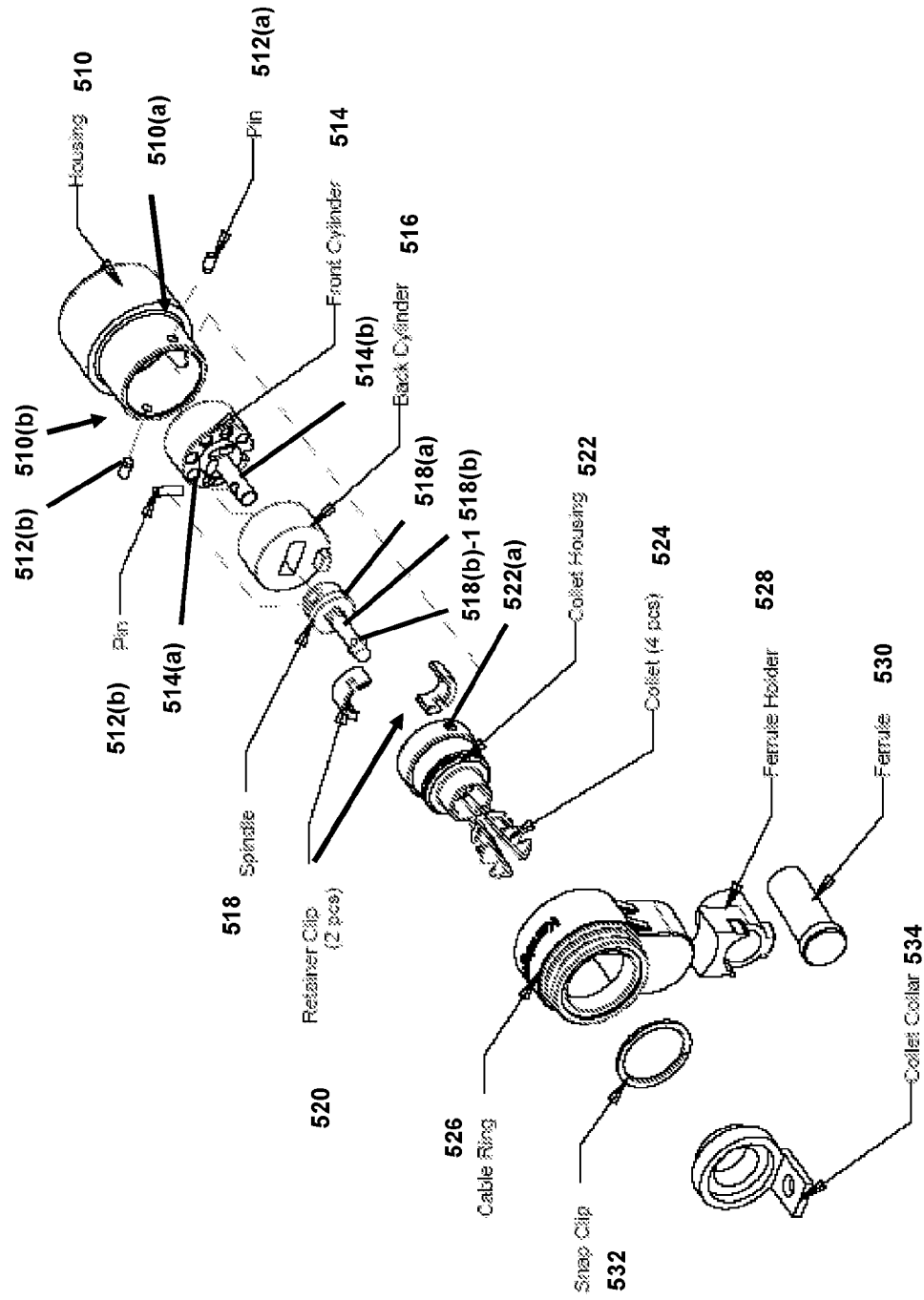


FIG. 3(f)

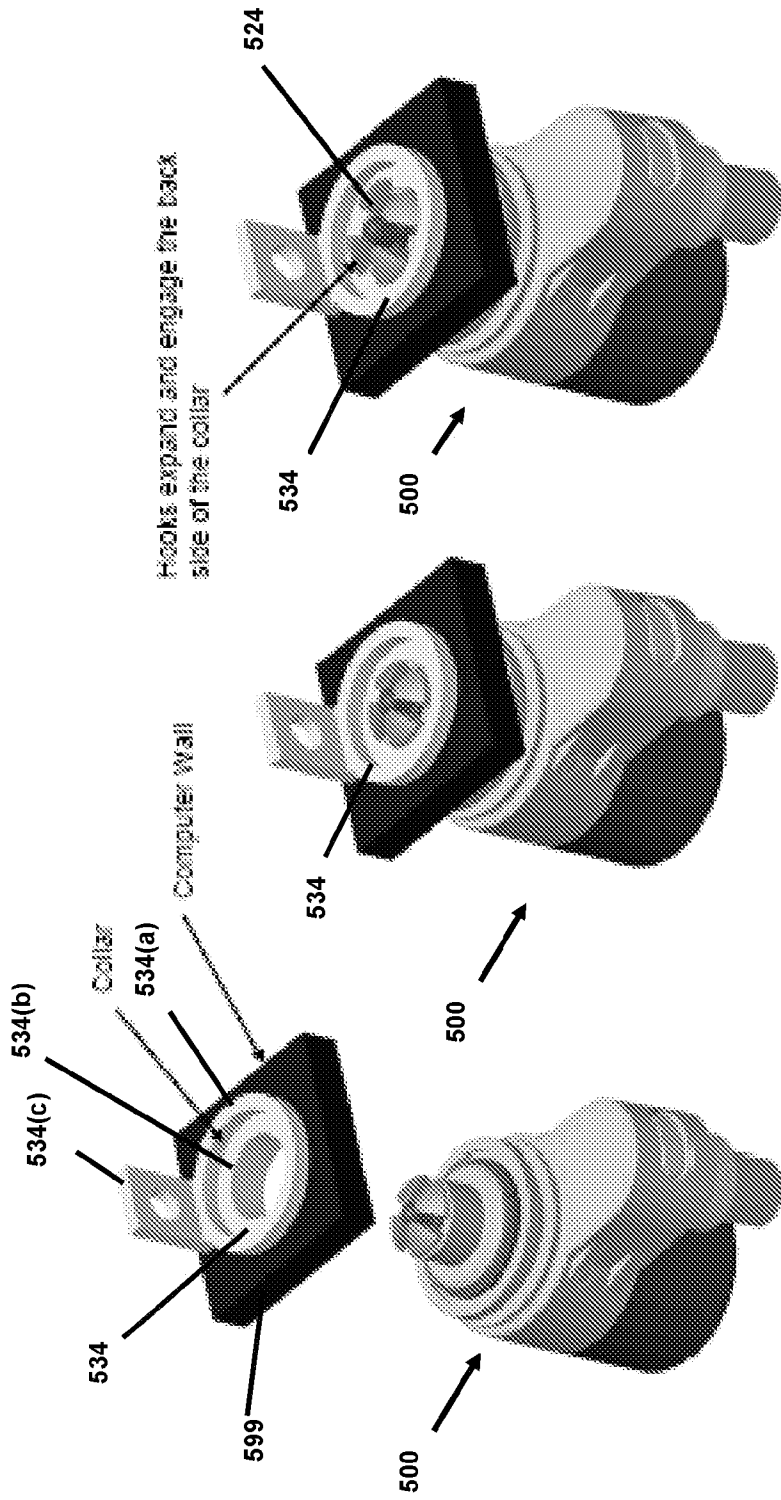


FIG. 4(c)

FIG. 4(b)

FIG. 4(a)

Locked

Unlocked