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Wang et al.

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(54) **MOUNTABLE TOOL COMPUTER INPUT**

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(73) Assignee: **APPLE INC.**, Cupertino, CA (US)

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Related U.S. Application Data

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(51) **Int. Cl.**

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G06F 3/01	(2006.01)
G06F 3/02	(2006.01)
G06F 3/038	(2013.01)
G06F 3/0485	(2022.01)

(52) **U.S. Cl.**
CPC ***G06F 3/03545*** (2013.01); ***G06F 3/016*** (2013.01); ***G06F 3/02*** (2013.01); ***G06F 3/038*** (2013.01); ***G06F 3/03547*** (2013.01); *G06F 3/0485* (2013.01)

(58) **Field of Classification Search**
CPC G06F 3/03545; G06F 3/016; G06F 3/02; G06F 3/03547; G06F 3/038; G06F 3/0485
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,712,101	A	12/1987	Culver
6,130,666	A	10/2000	Persidsky
9,116,560	B1	8/2015	Habash
10,452,169	B2	10/2019	Wang et al.
10,564,724	B1	2/2020	Bergeron et al.
2009/0195499	A1	8/2009	Griffin

(Continued)

FOREIGN PATENT DOCUMENTS

CN	202421939 U	9/2012

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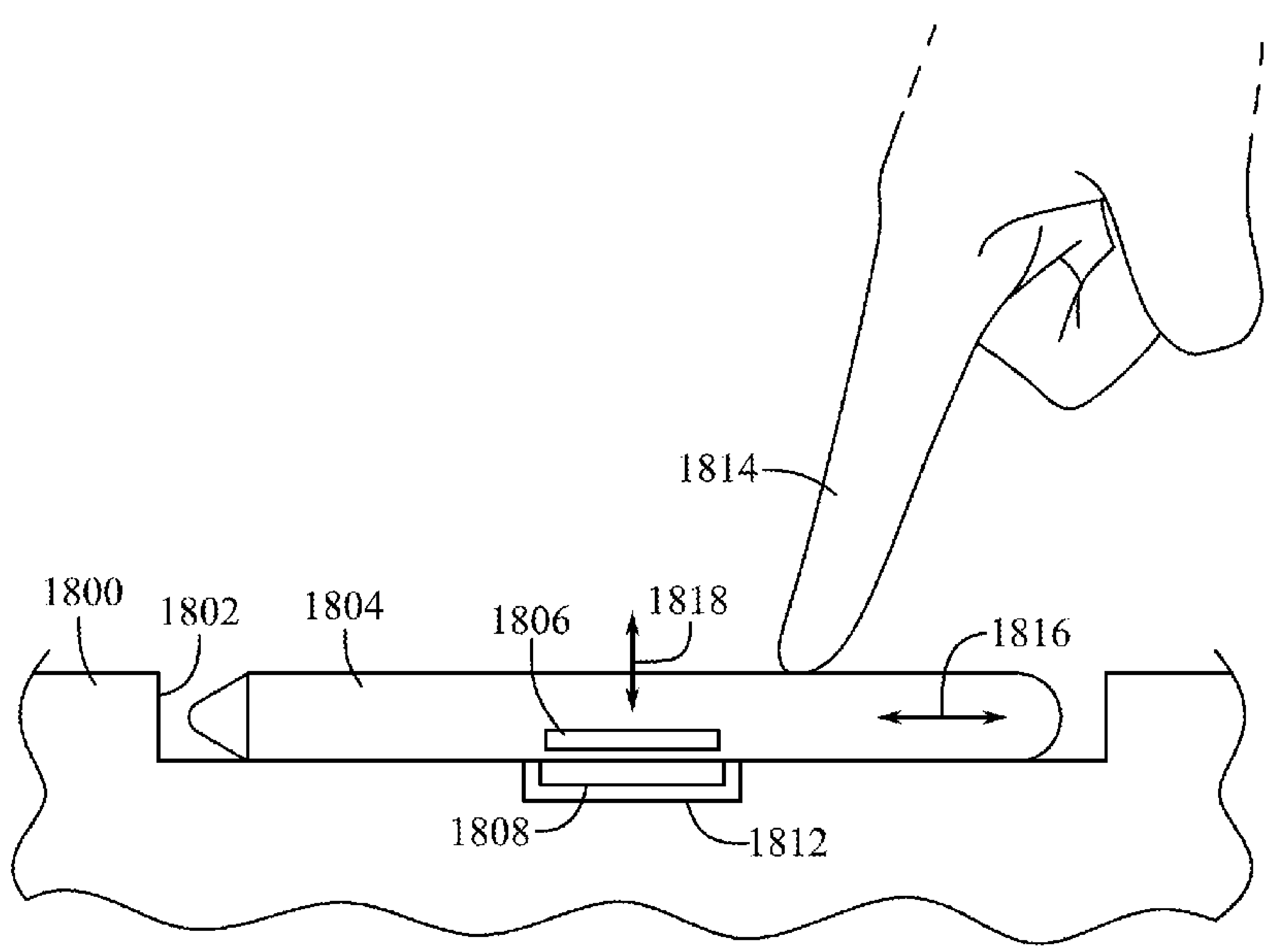
(57) **ABSTRACT**

Computing systems and input devices can include a chassis with a computing device and an input tool with a sensor, such as a pen- or rod-like input tool, that can be positioned relative to the chassis in multiple configurations. In one configuration, the tool can be spaced away from the chassis and its sensor output can cause a first output signal in response to input provided to the sensor. In another configuration, the tool can be contacting the chassis and its sensor output can cause a second output signal in response to input provided to the sensor. For example, an input tool can be stowed in a recess of a keyboard housing or device chassis, and the input tool can produce a first output when it is in the recess and a second input when it has been removed from the chassis.

20 Claims, 12 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

2010/0085325	A1	4/2010	King-Smith et al.	
2014/0253463	A1	9/2014	Hicks	
2014/0253464	A1	9/2014	Hicks et al.	
2014/0253469	A1	9/2014	Hicks et al.	
2015/0156290	A1*	6/2015	Amit	H04M 1/026 345/179
2016/0274761	A1	9/2016	Alonso Ruiz et al.	
2017/0090572	A1*	3/2017	Holenarsipur	G06F 3/0362
2017/0097698	A1	4/2017	Maeshima	
2017/0205879	A1*	7/2017	Joseph	G06F 3/03544
2017/0222456	A1	8/2017	Perez et al.	
2019/0079584	A1*	3/2019	Bonanno	G06F 3/03543
2020/0012358	A1	1/2020	Marshall et al.	
2020/0050338	A1	2/2020	Choi et al.	
2021/0099025	A1*	4/2021	Gaule	H02J 50/10

* cited by examiner

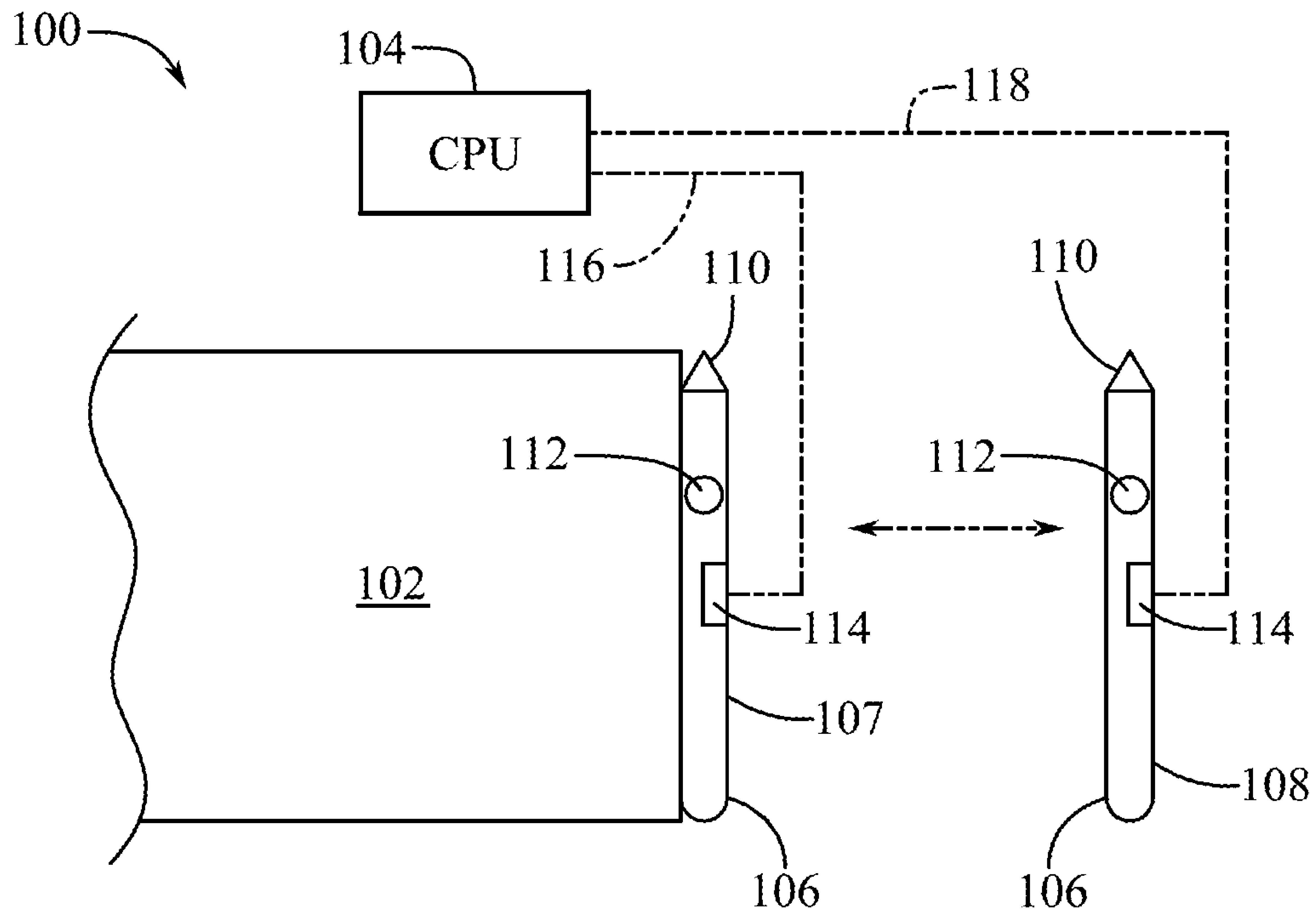

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FIG. 1

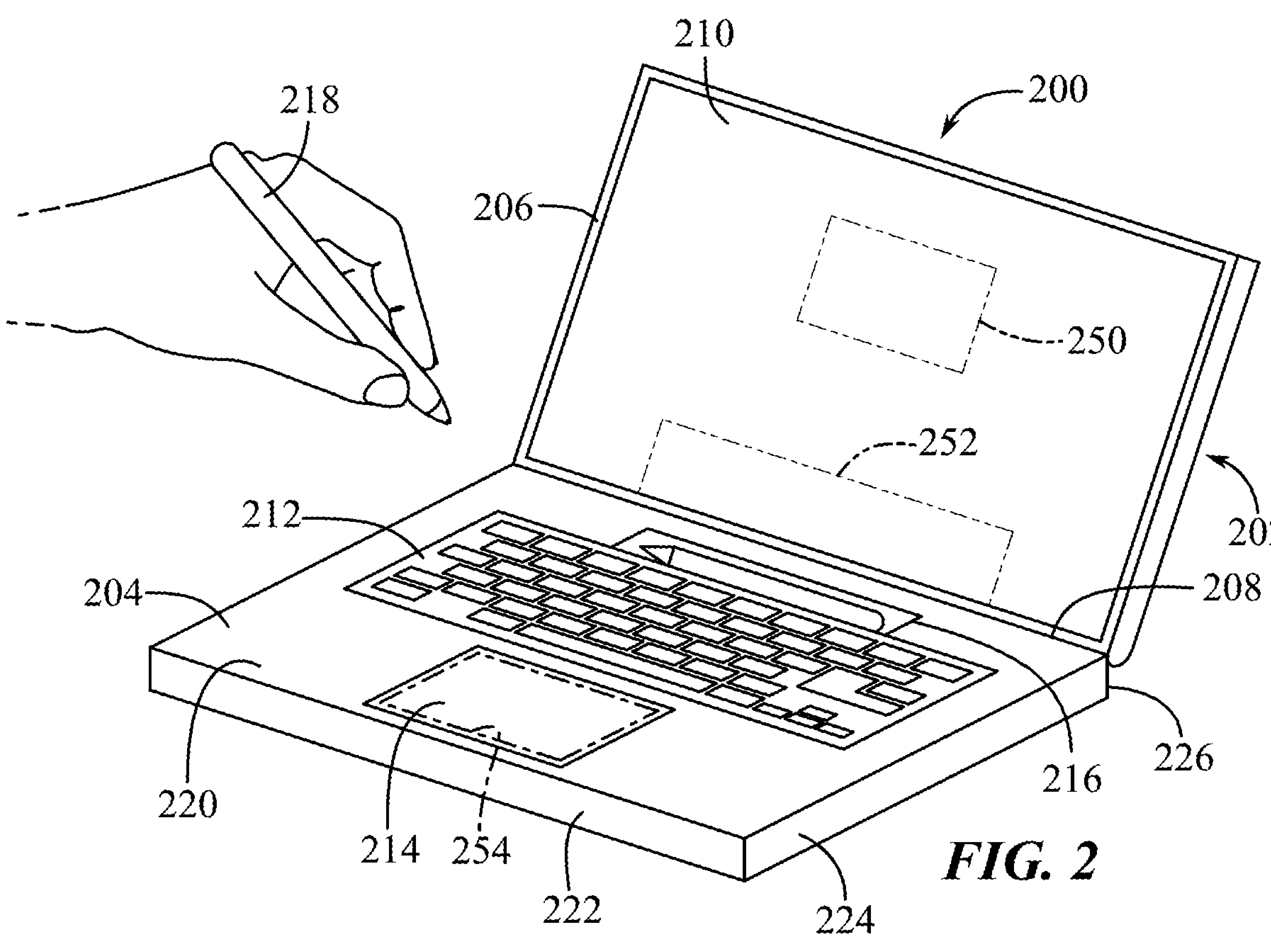
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FIG. 2

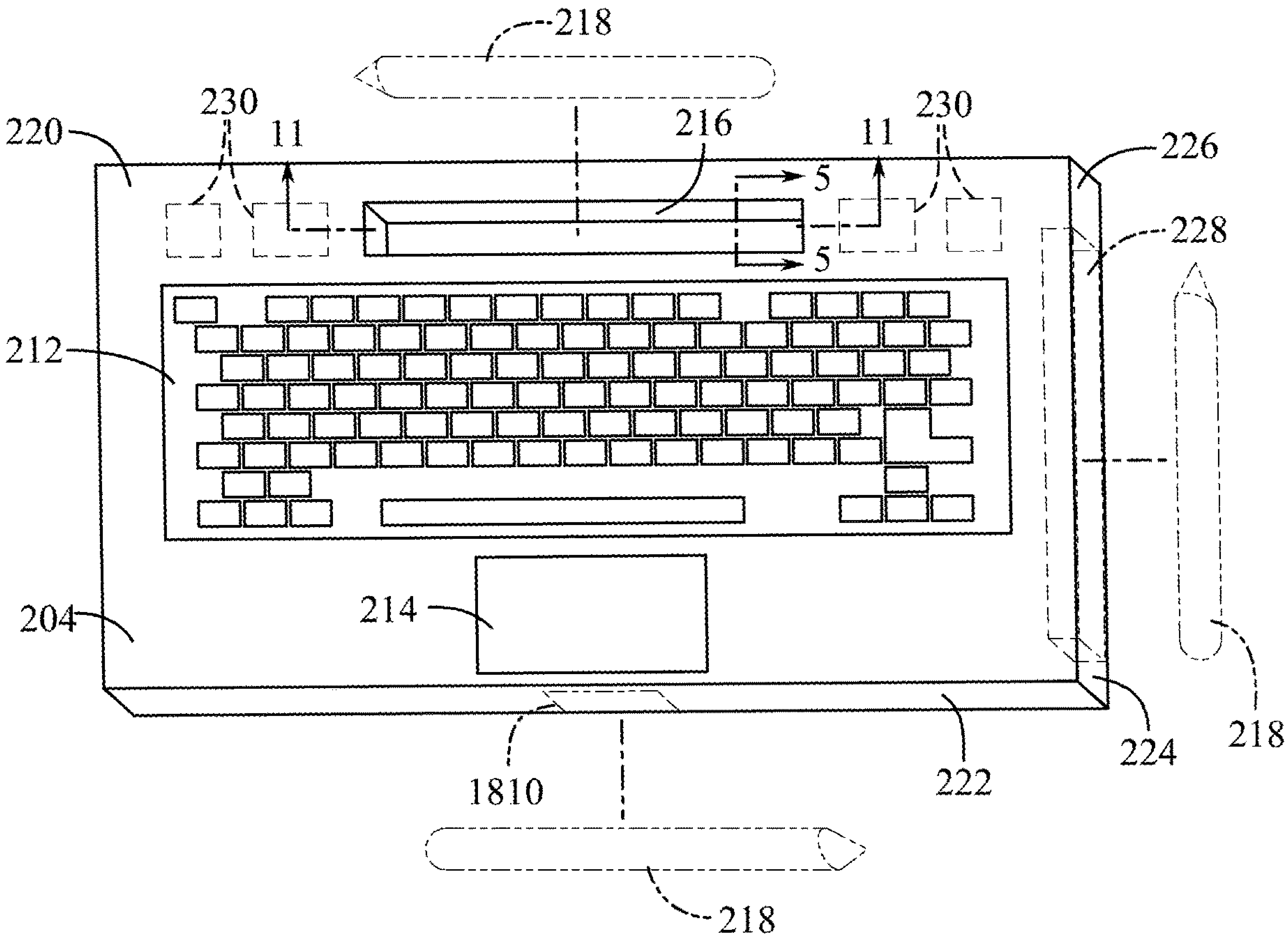

FIG. 3

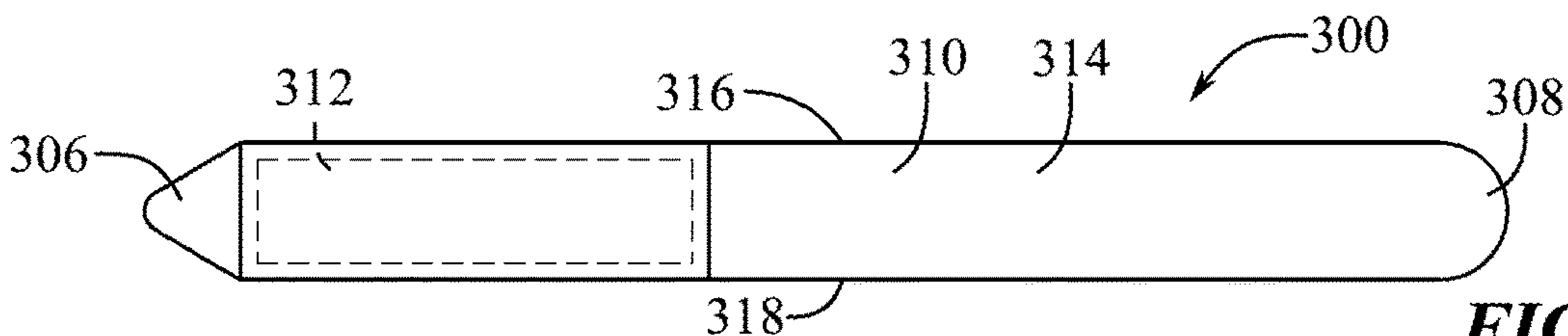

FIG. 4A

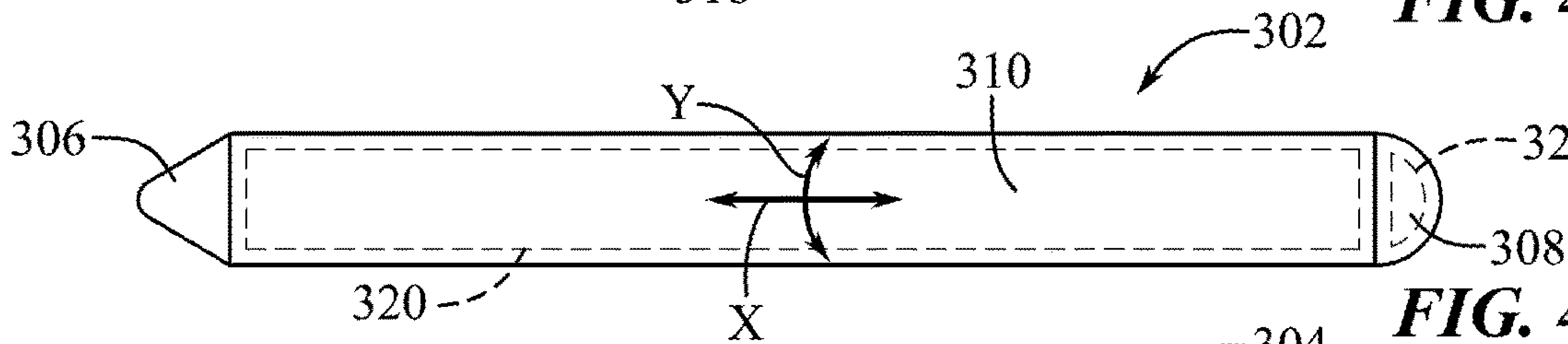

FIG. 4B

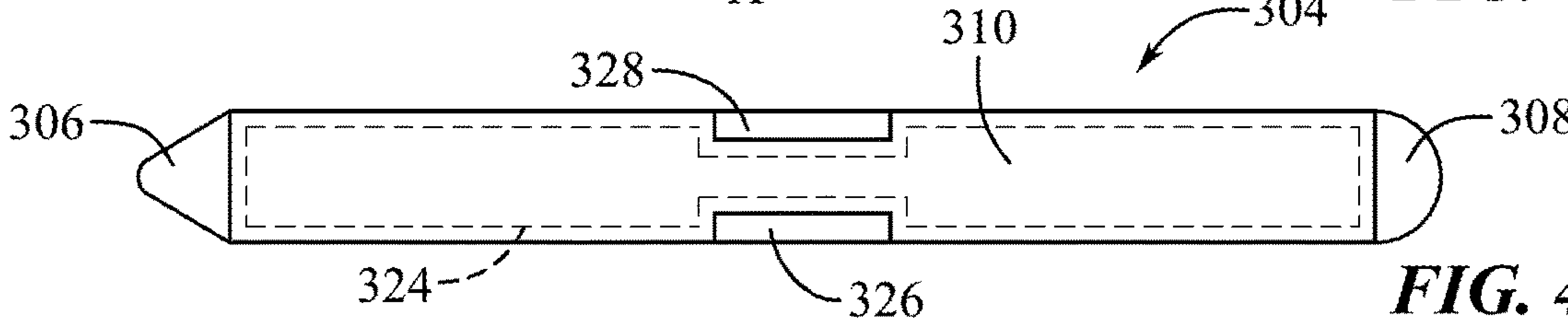

FIG. 4C

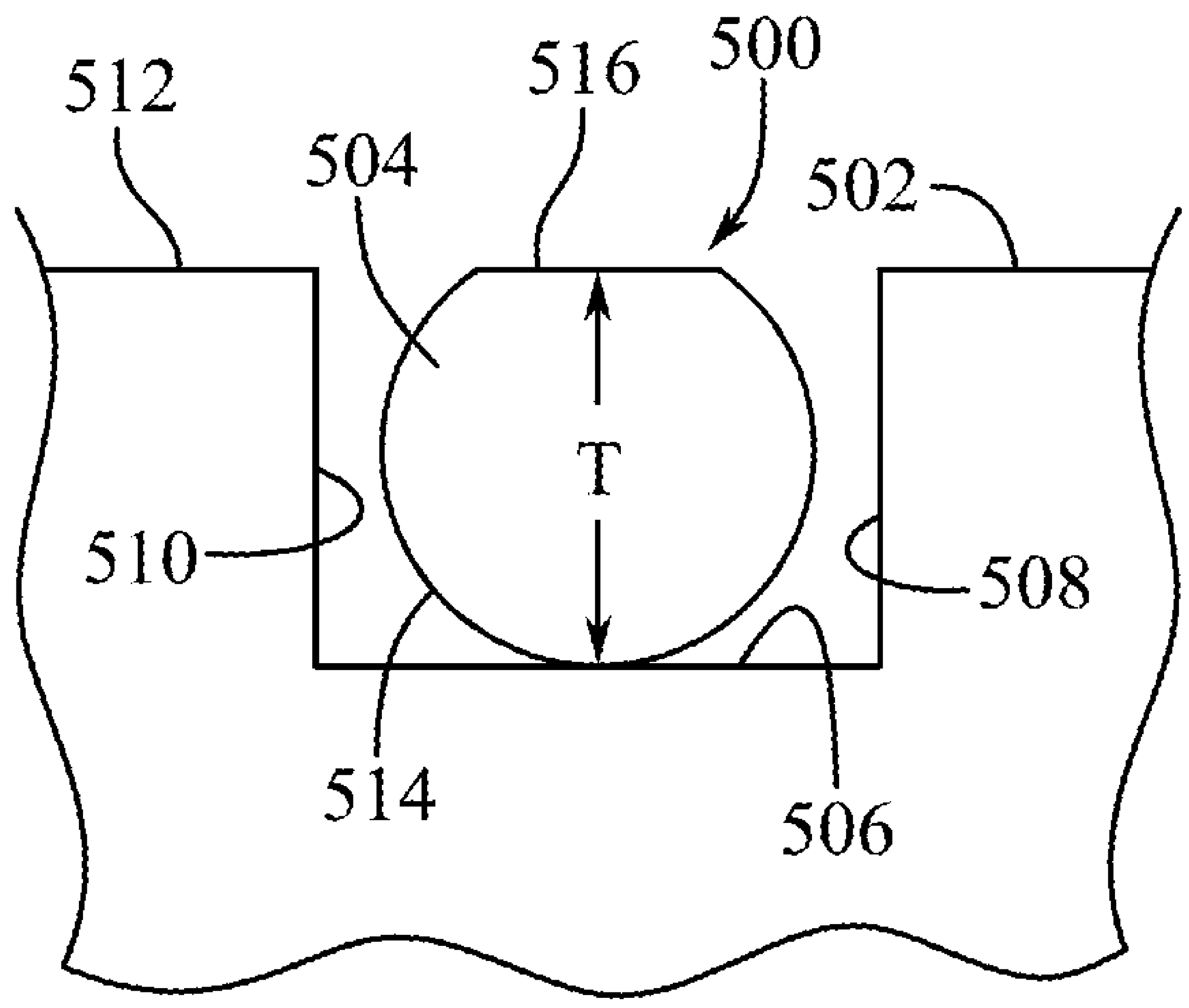

FIG. 5

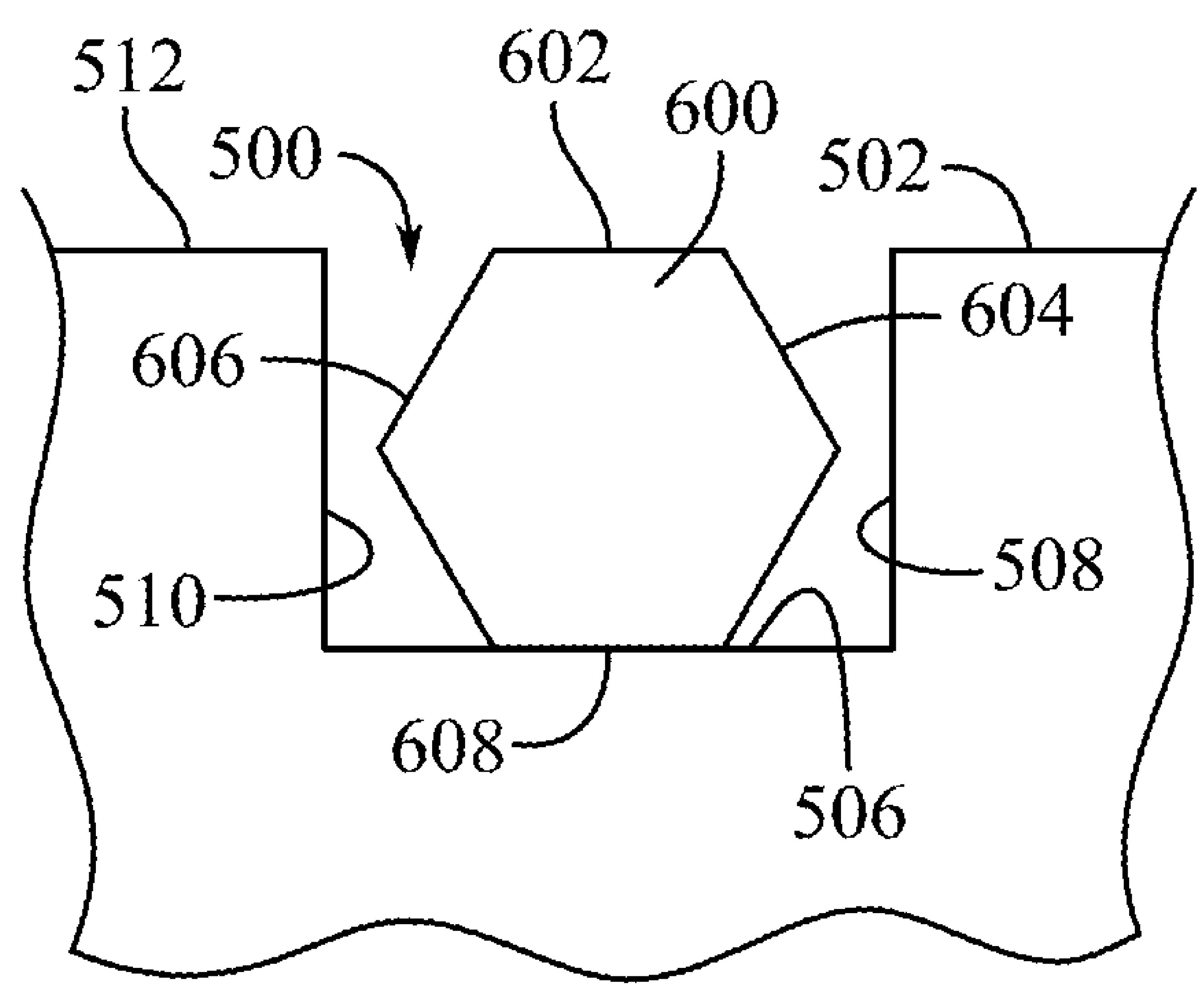

FIG. 6

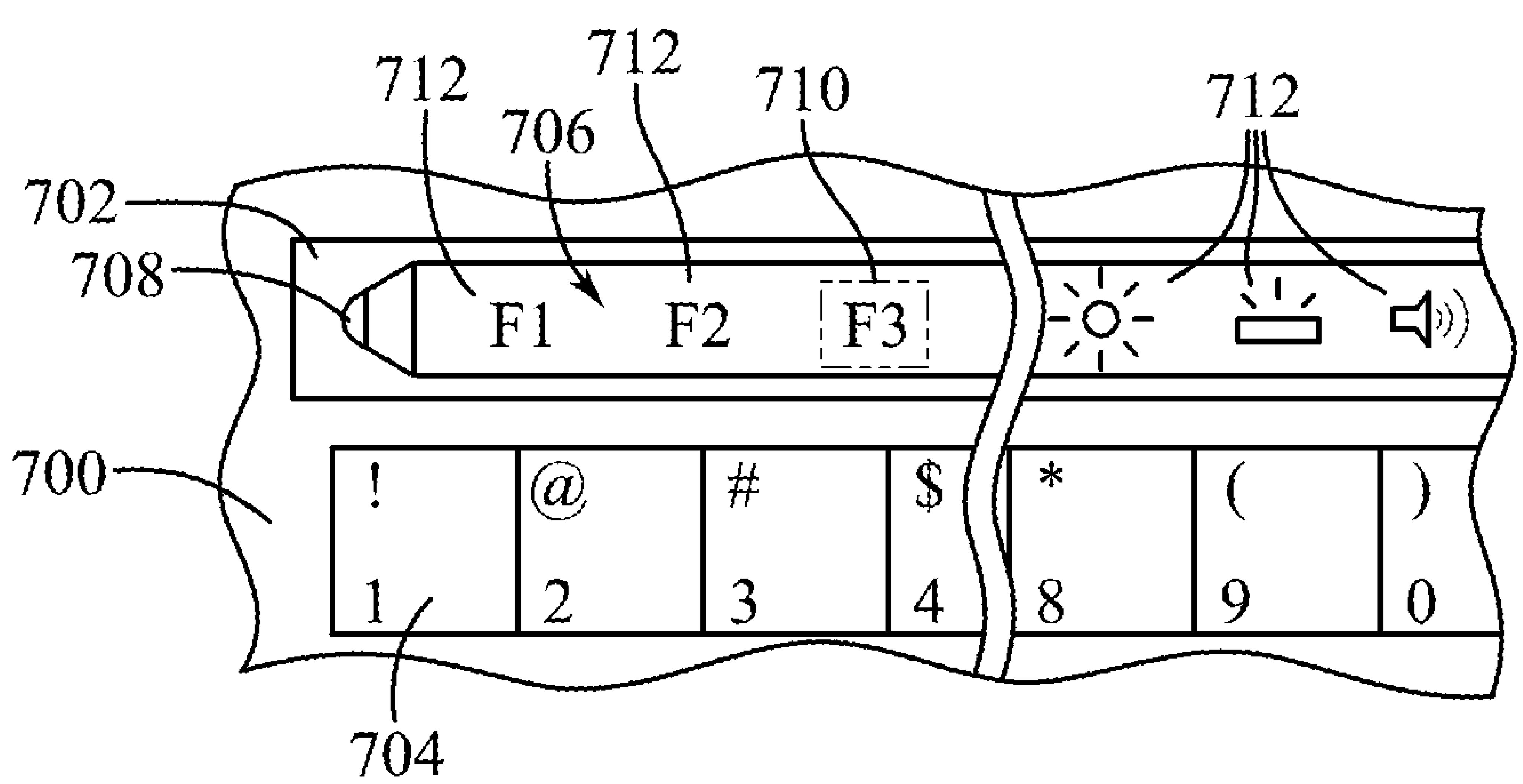

FIG. 7

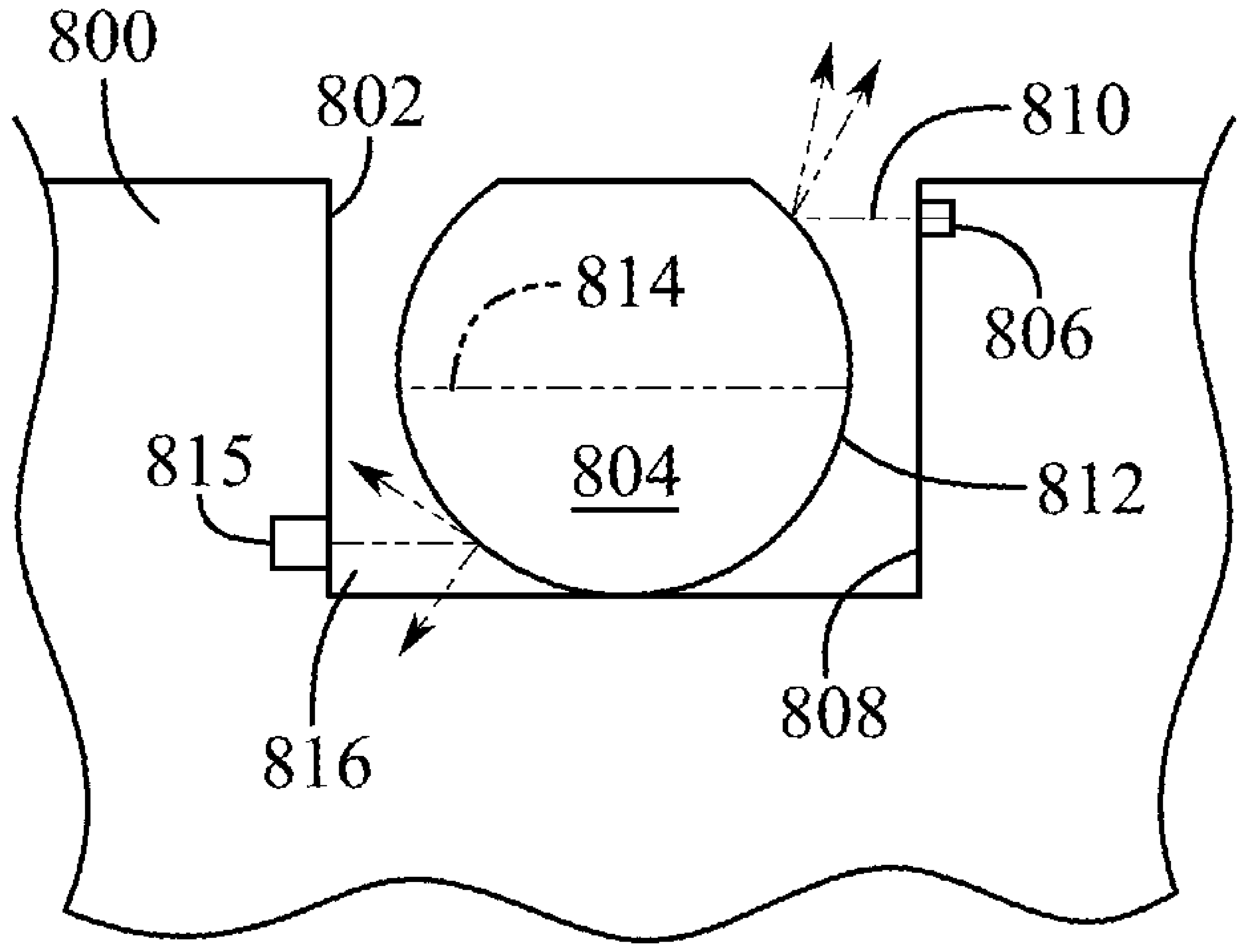
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FIG. 8

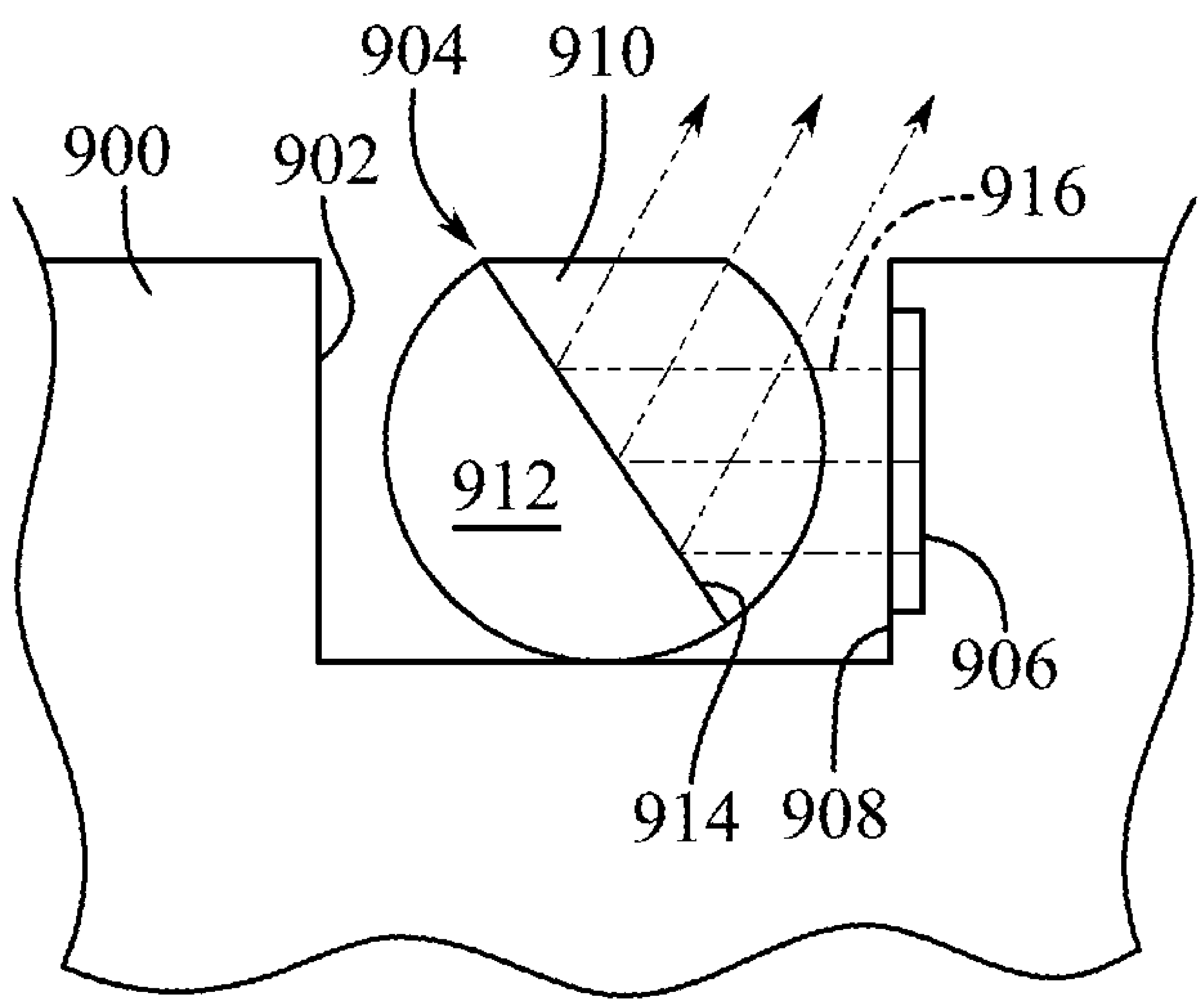
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FIG. 9

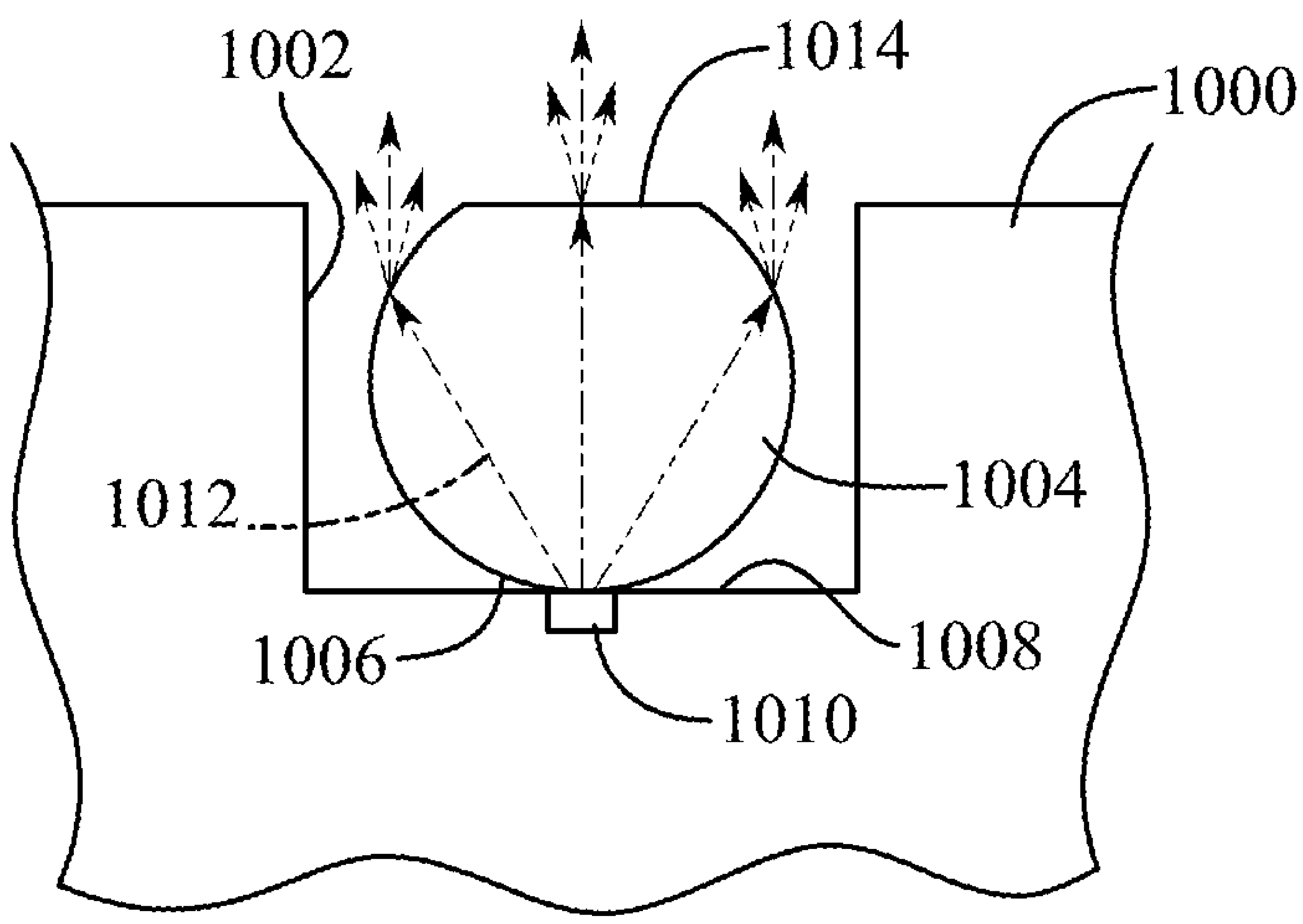

FIG. 10

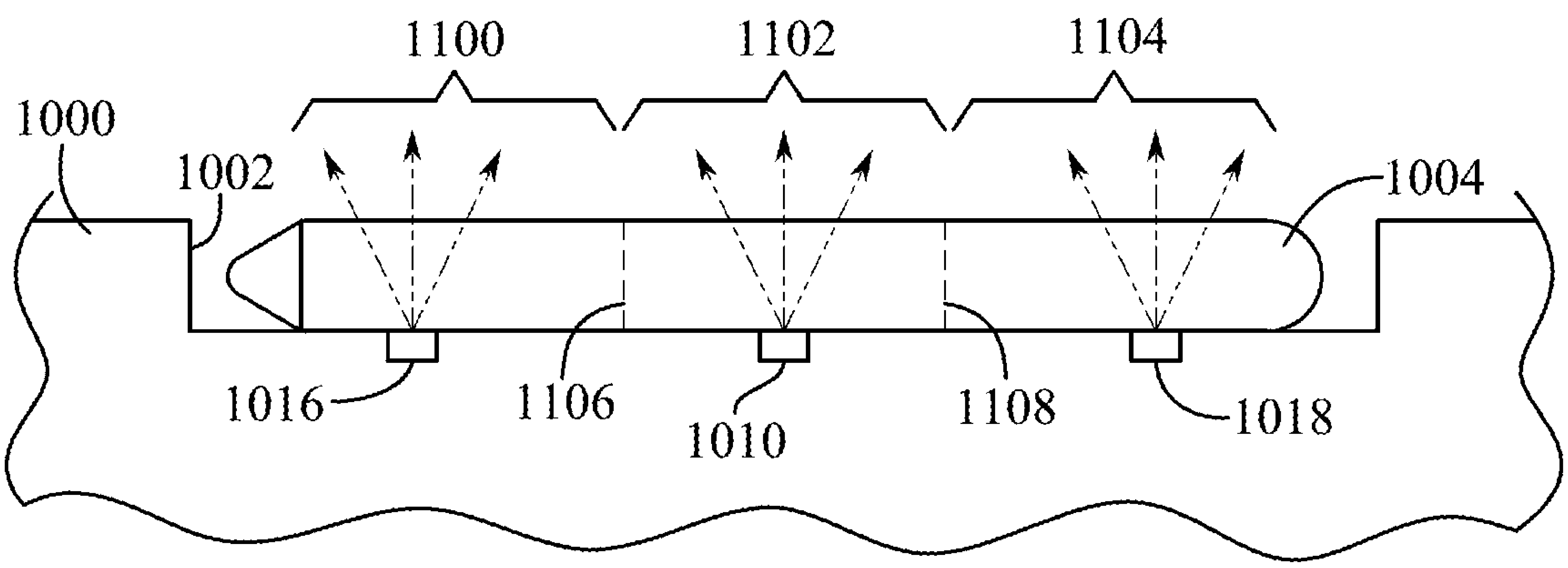

FIG. 11

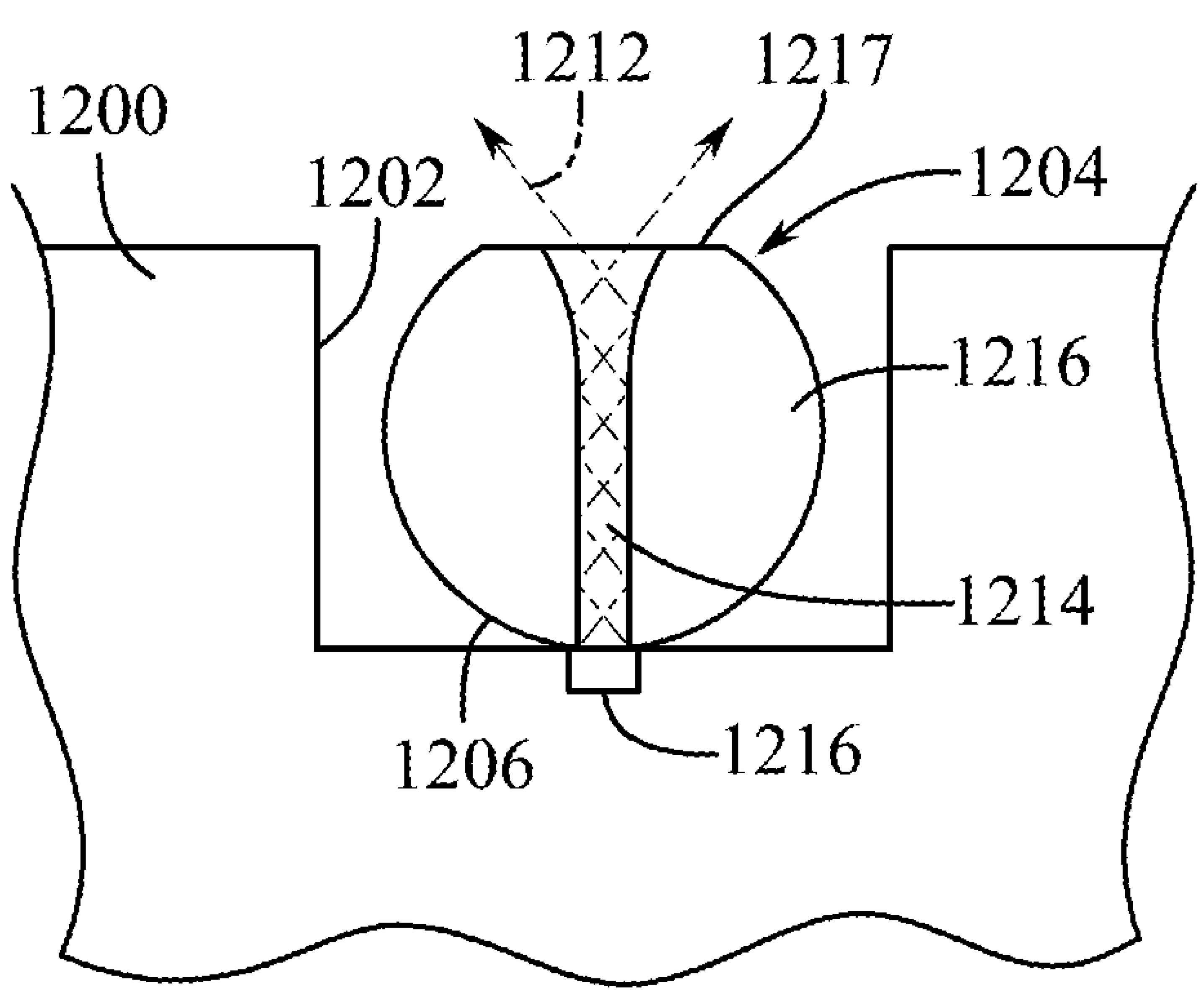

FIG. 12

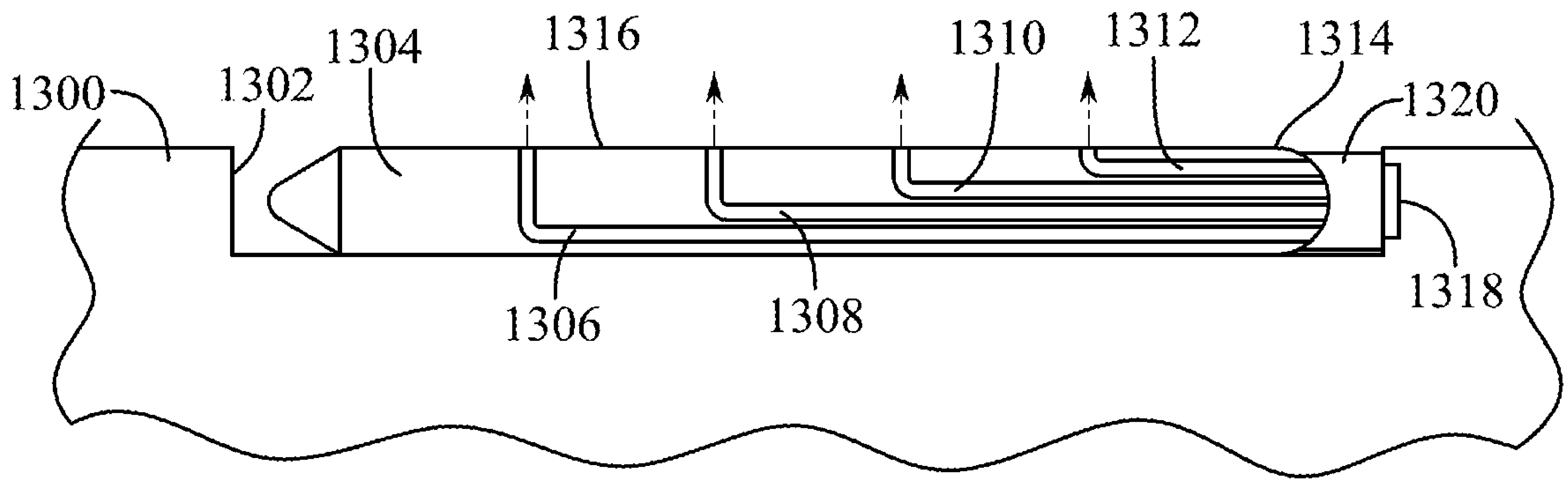

FIG. 13

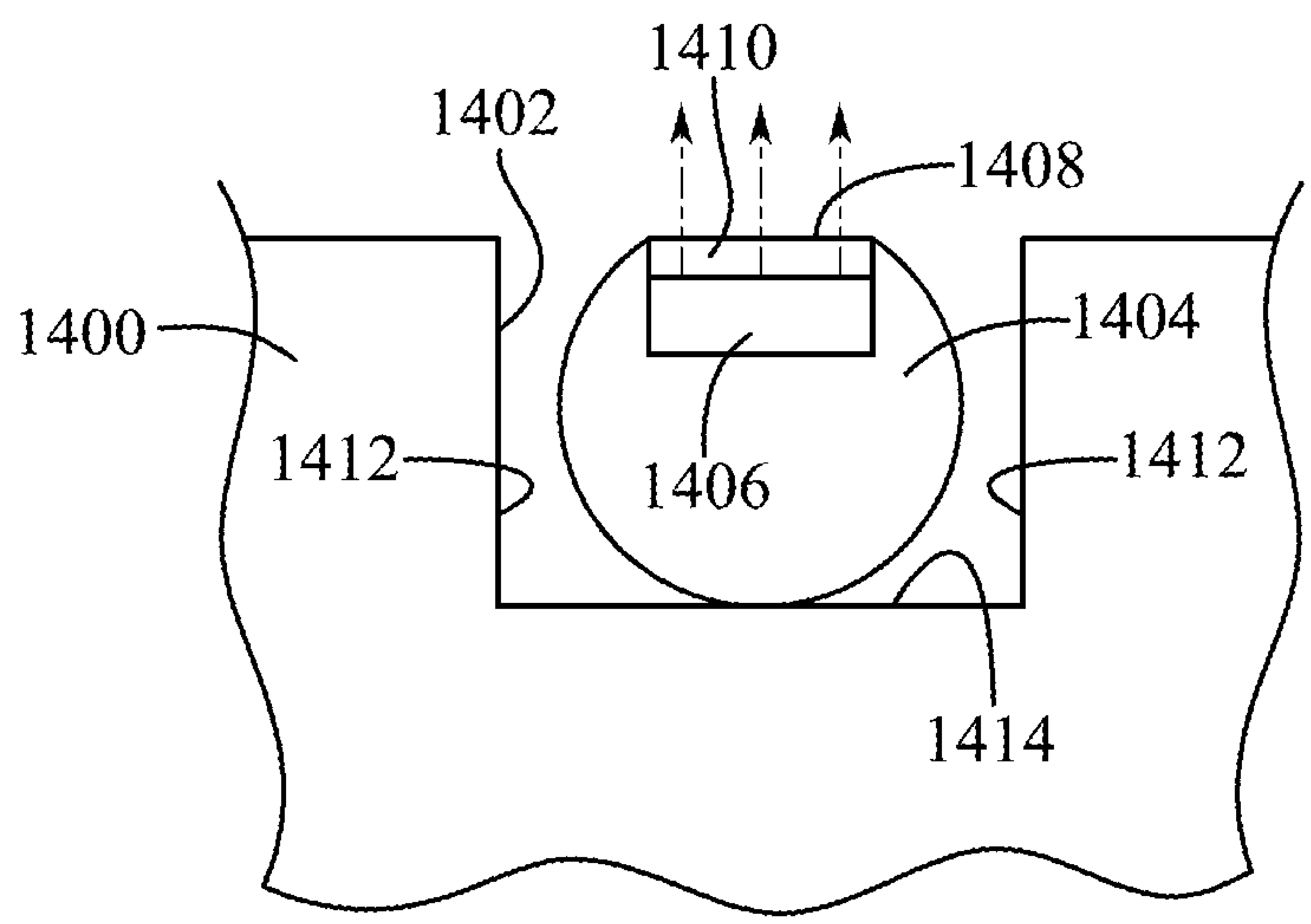

FIG. 14

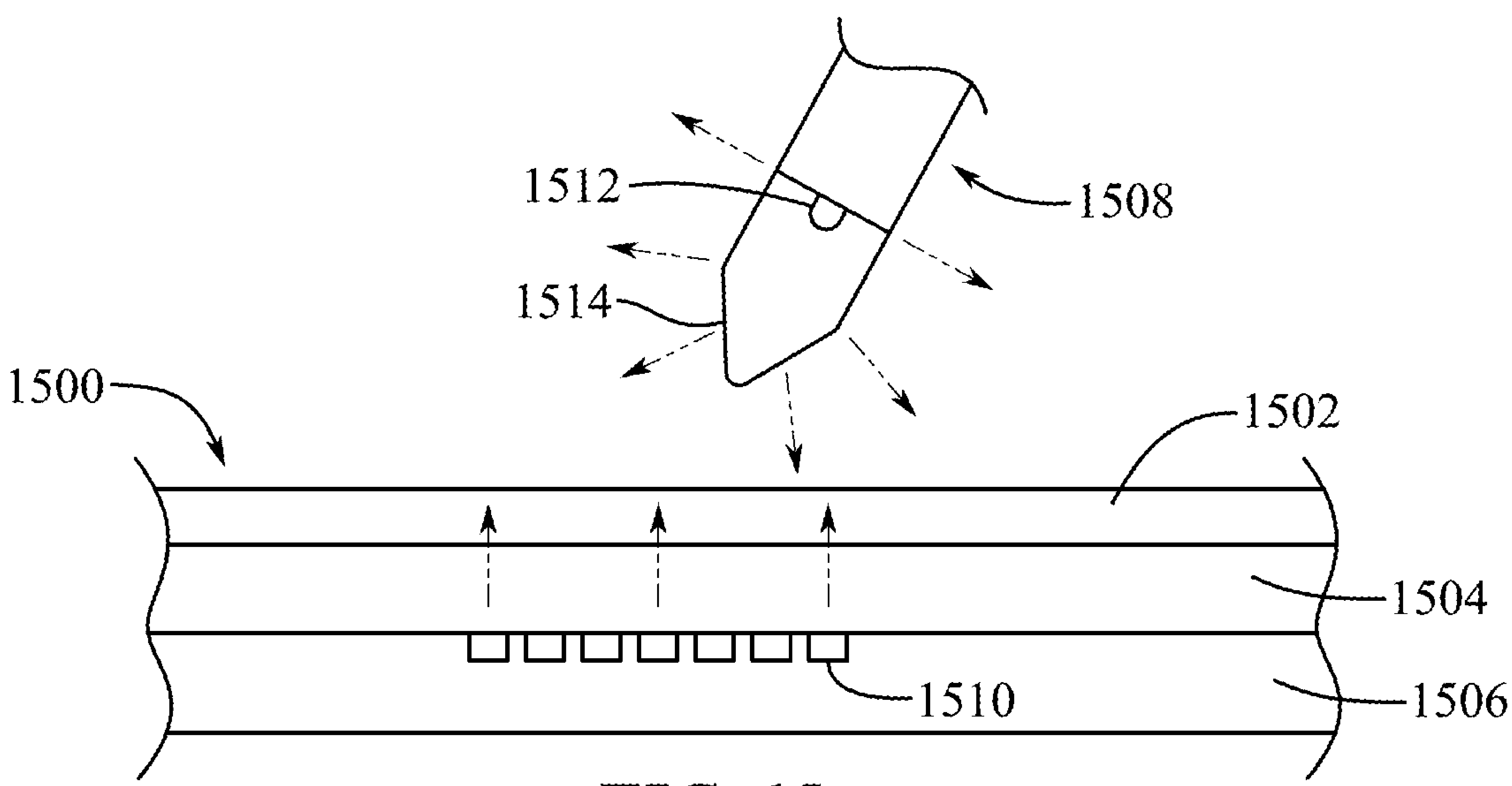

FIG. 15

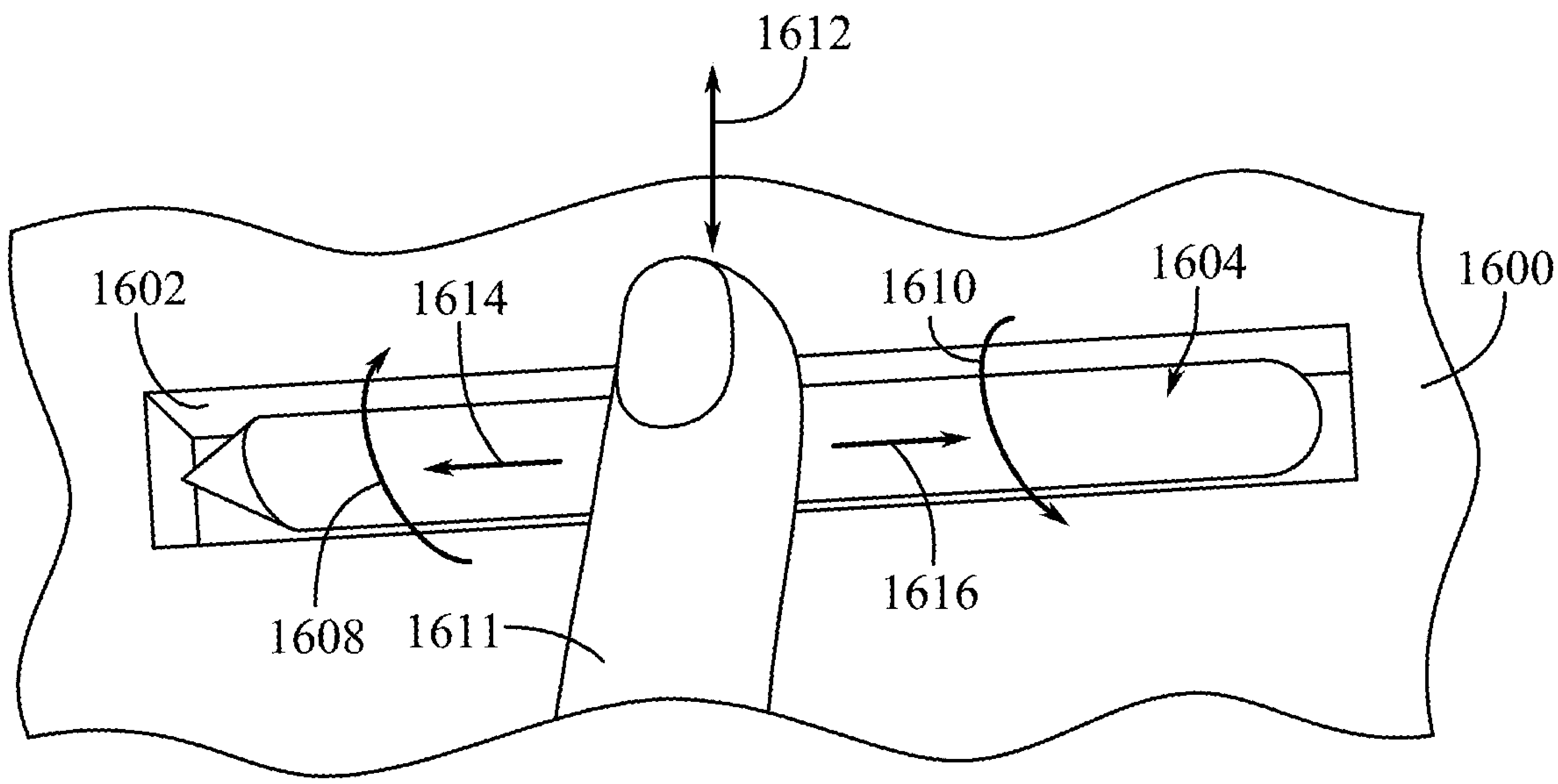

FIG. 16

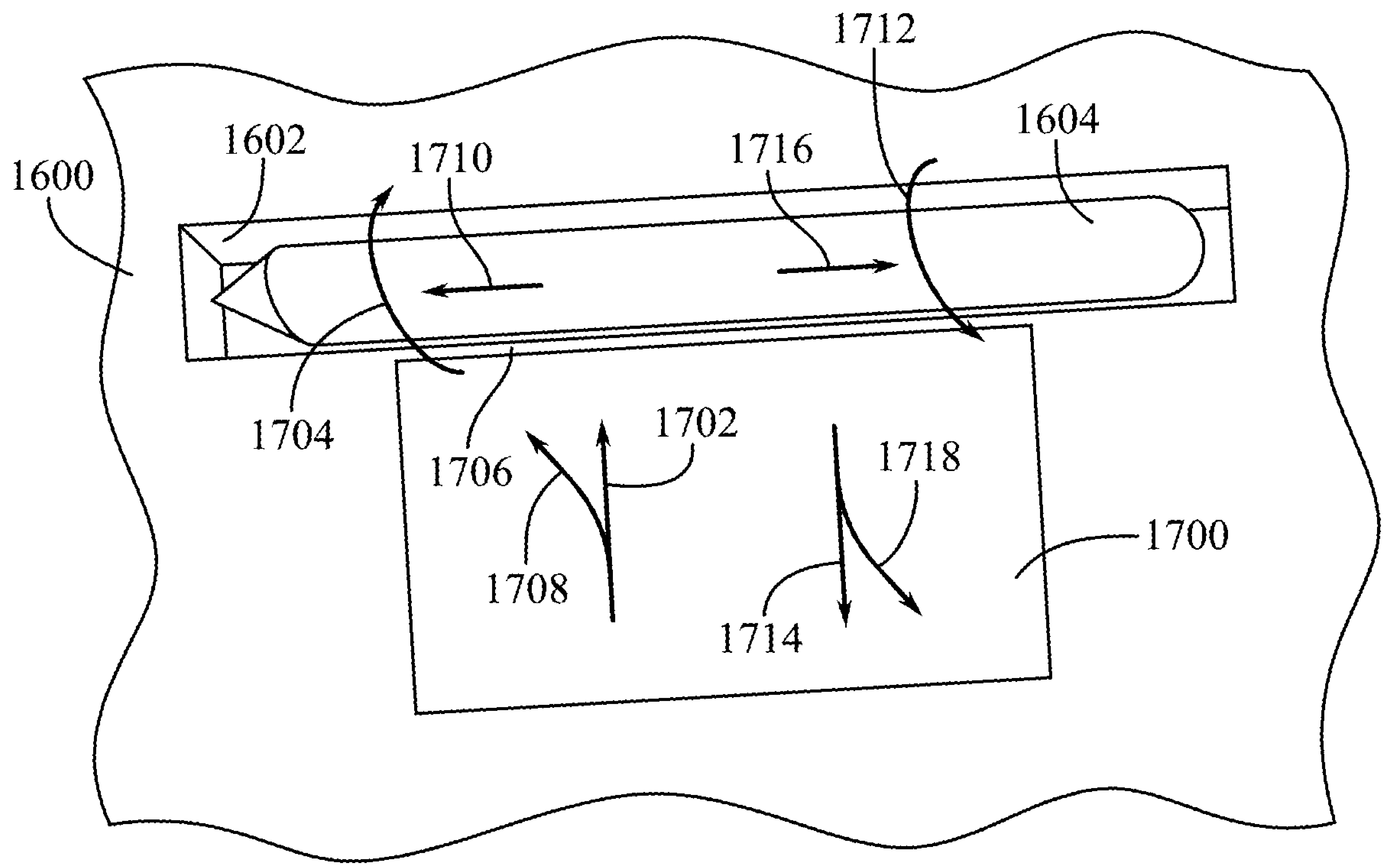
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FIG. 17

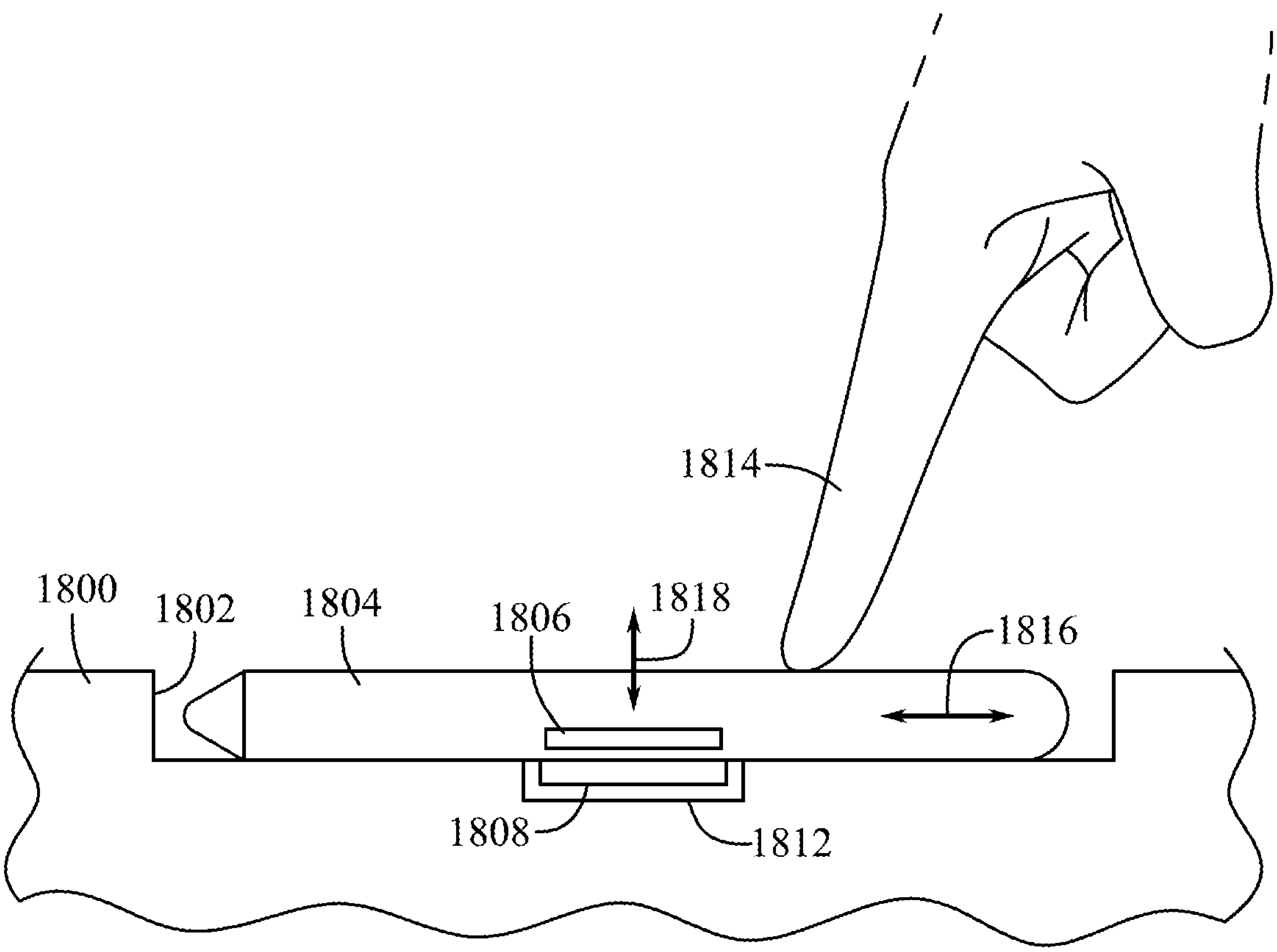

FIG. 18

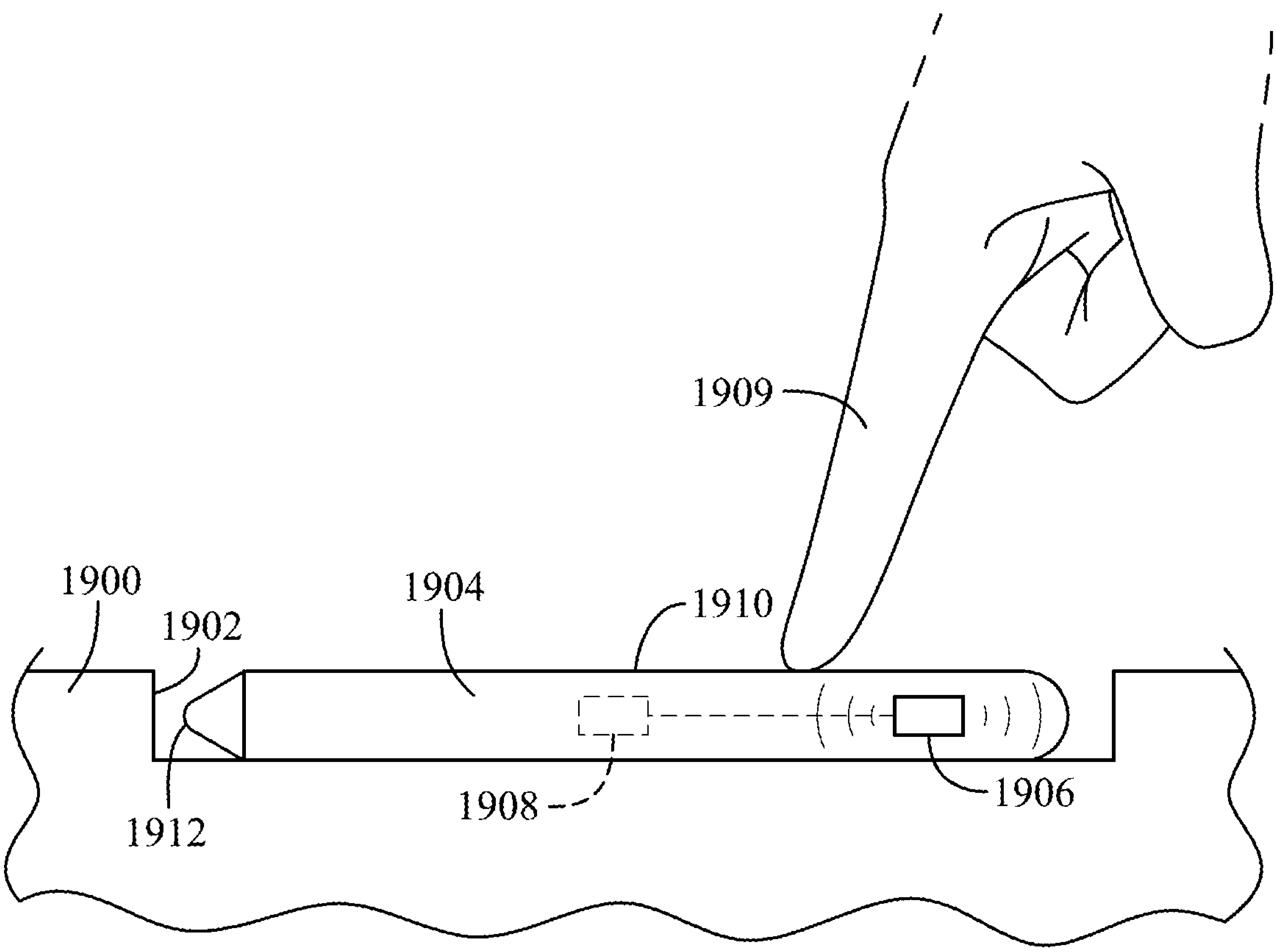

FIG. 19

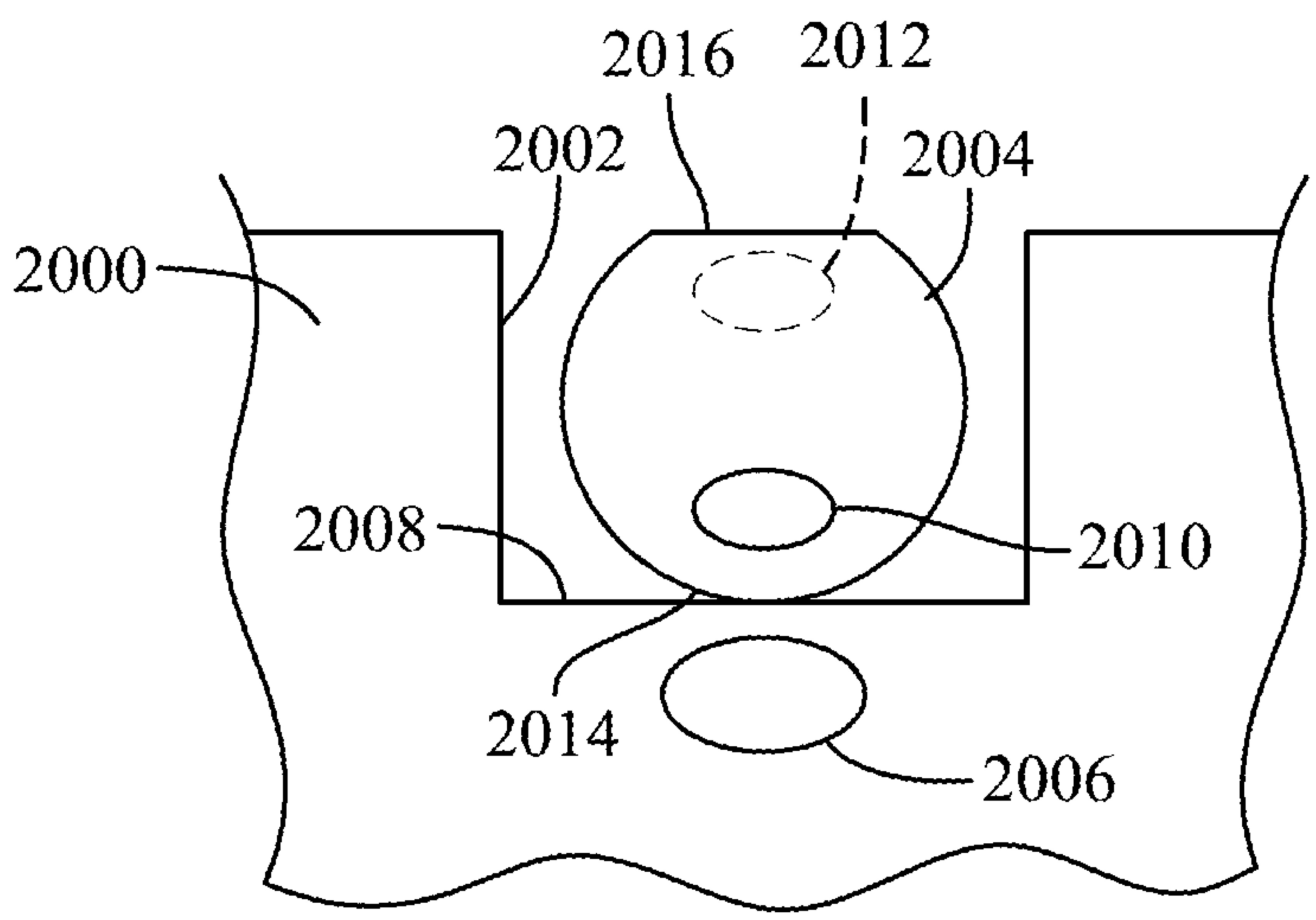
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FIG. 20

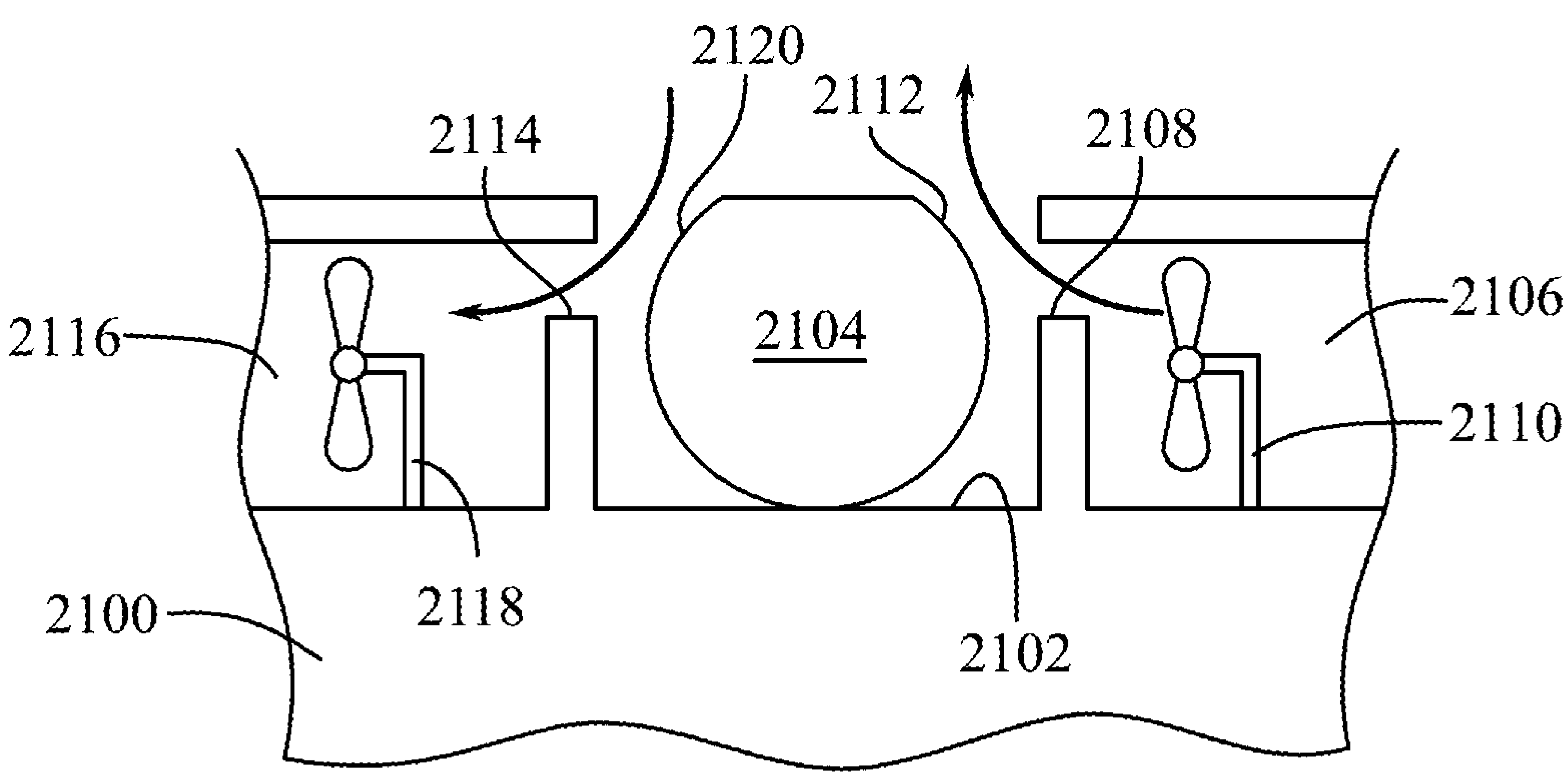
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FIG. 21

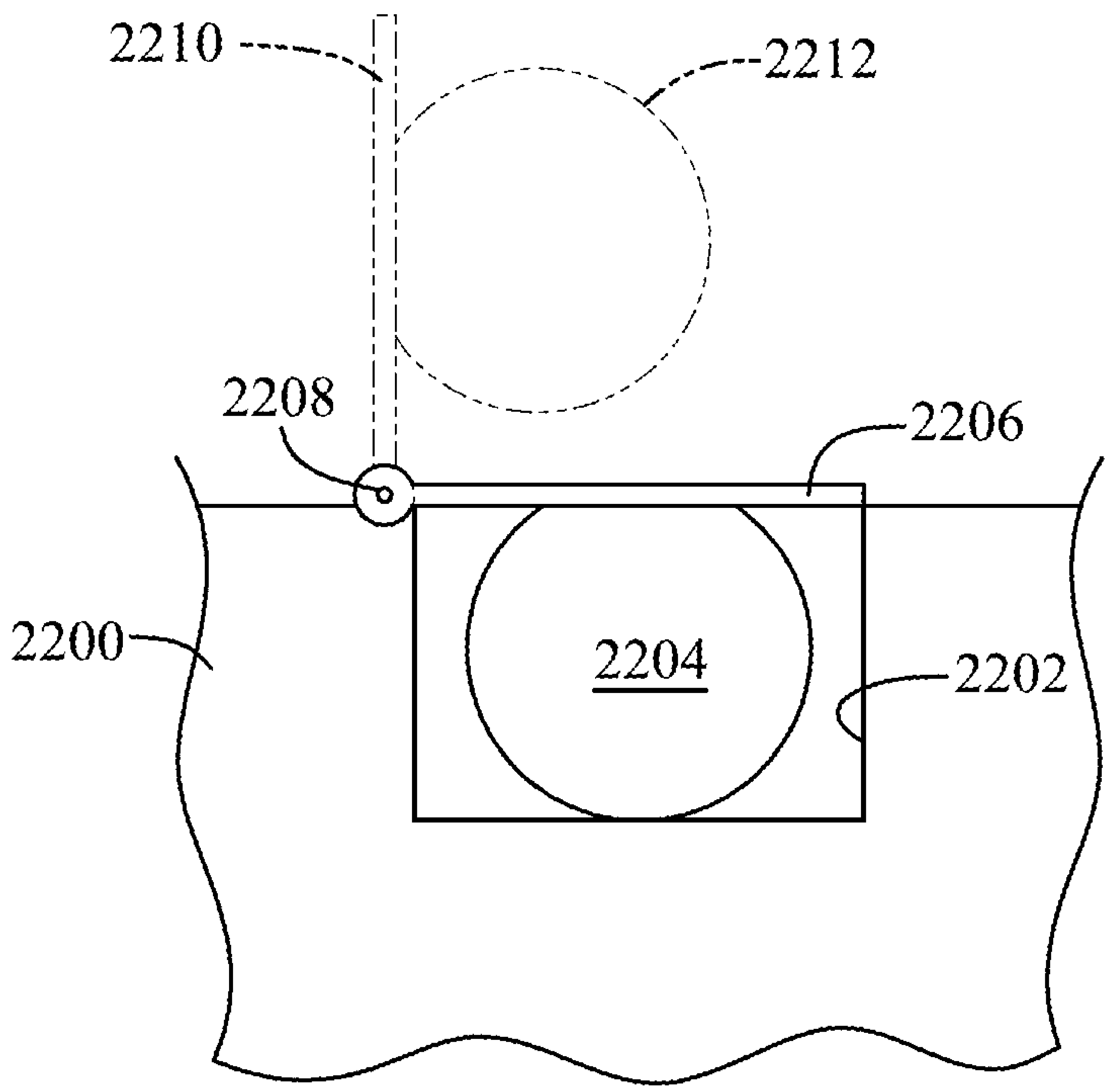

FIG. 22

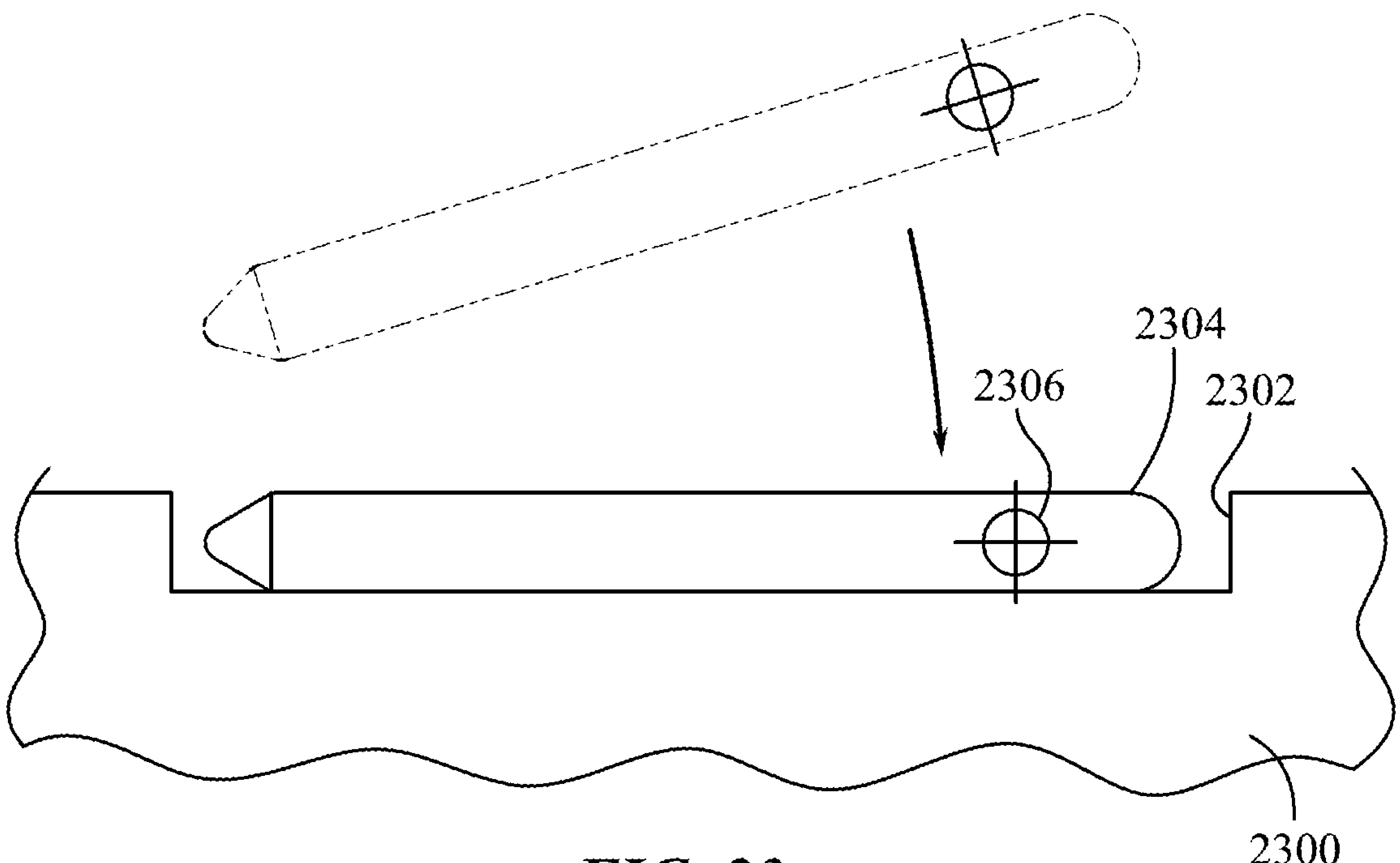

FIG. 23

MOUNTABLE TOOL COMPUTER INPUT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is continuation of U.S. patent application Ser. No. 16/789,173, filed 12 Feb. 2020, and entitled "MOUNTABLE TOOL COMPUTER INPUT," the disclosure of which is incorporated herein in its entirety.

FIELD

The described embodiments relate generally to input device systems. More particularly, the present embodiments relate to input devices incorporating a stylus that is removably mounted to a keyboard or similar input device.

BACKGROUND

A variety of handheld input devices are used to detect user input. For example, a stylus is often used to provide input by contacting a digitizer or touch-sensitive panel of an electronic device. The touch panel may include a touch-sensitive surface that, in response to detecting a touch event, generates a signal that can be processed and used by other components of the electronic device. A display component of the electronic device may display textual and/or graphical display elements representing selectable virtual buttons or icons, and the touch sensitive surface may allow a user to navigate and change the content displayed on the display screen. Typically, a user can move one or more input devices, such as a stylus, across the touch panel in a pattern that the device translates into an input command. Some styluses can be touch- and force-sensitive to provide writing or drawing input to the electronic device. Functions of the stylus or electronic device can also be remotely controlled by interacting with a sensor on the stylus while the stylus is handheld.

SUMMARY

Aspects of the present disclosure relate to a computing system comprising a chassis, a computing device, and an input tool having a sensor, with the input tool being positionable relative to the chassis in a first configuration and in a second configuration. In the first configuration, the input tool can be spaced away from the chassis and the computing device can be configured to output a first signal in response to input provided to the sensor. In the second configuration, the input tool can contact the chassis and the computing device can be configured to output a second signal in response to input provided to the sensor, with the first signal being unique relative to the second signal.

In some embodiments, the input tool is generally rod-shaped. The chassis can comprise a recess to receive the input tool in the second configuration. The second signal can produce haptic feedback at a surface of the input tool or can indicate a scrolling input. The input tool can be positioned at an end of a trackpad in the chassis when in the second configuration. The input tool can be positioned at an edge of a key-based input device positioned in the chassis when in the second configuration. The input tool can be positioned at an outer side surface of the chassis when in the second configuration.

Another aspect of the disclosure relates to a computing system comprising a housing having a tool retention portion, a keyboard apparatus supported by the housing, a tool

removably positioned in the tool retention portion, with the tool having an object sensor, and an electronic component in electronic communication with the sensor and configured to detect an object at the tool retention portion via a signal generated by the object sensor.

In some cases, the electronic component can be further configured to adjust an appearance of a user interface in response to detecting the object. The user interface can be a graphical user interface displayed by a display screen. Adjusting the appearance of the user interface can include changing the appearance of a light emitted from the keyboard apparatus. The object sensor can be configured to generate the signal in response to detecting a portion of a hand of a user. The housing can further comprise a cover over the tool when the tool is positioned in the tool retention portion, wherein the object can be detectable by the object sensor through the cover.

Still another aspect of the disclosure relates to a user interface device comprising an input tool having a length, a tip, and a transducer, with the transducer being configured to sense a force applied at the tip, an input device body having an input tool retention portion, wherein the input tool is movable between a first position retained to the input device body at the input tool retention portion and a second position spaced away from the input tool retention portion, a light source within the input tool or within the input device body, and a set of indicators at a surface of the input tool and distributed along the length of the input tool, with the set of indicators being illuminated by the light source when the input tool is in the first position.

In some cases, the set of indicators can comprise a set of symbols positioned along the length of the input tool. The user interface device can further comprise a light guide positioned in the input tool, with the light guide directing light from the light source to the set of indicators. The set of indicators can comprise a first row of indicators extending lengthwise along a first side of the input tool and a second row of indicators extending lengthwise along a second side of the input tool, with the second side being angularly offset relative to the first side about a longitudinal axis of the input tool. The set of indicators can be configured to be illuminated by diffusion of light through the input tool and can comprise a display positioned at or within the surface of the input tool.

BRIEF DESCRIPTION OF THE DRAWINGS

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, and in which:

FIG. **1** shows a block diagram of a computing system.

FIG. **2** shows a perspective view of a computing system including a computing device and an input tool.

FIG. **3** shows a perspective view of a lower housing of a computing device.

FIGS. **4**A-**4**C show side views of embodiments of input tools.

FIG. **5** shows a diagrammatic end section view of a housing and input tool as taken through section lines **5**-**5** in FIG. **3**.

FIG. **6** shows a diagrammatic end section view of a housing and input tool.

FIG. **7** shows partial top views of a housing and input tool.

FIG. **8** shows a diagrammatic end section view of a housing and input tool being illuminated.

FIG. **9** shows a diagrammatic end section view of a housing and input tool being illuminated.

FIG. **10** shows a diagrammatic end section view of a housing and input tool being illuminated.

FIG. **11** shows a diagrammatic side section view of a housing recess and input tool being illuminated.

FIG. **12** shows a diagrammatic end section view of a housing and input tool.

FIG. **13** shows a diagrammatic side section view of a housing recess and input tool.

FIG. **14** shows a diagrammatic end section view of a housing recess and input tool.

FIG. **15** shows a diagrammatic side section view of a housing and input tool.

FIG. **16** shows a diagrammatic perspective view of an input tool being operated in a recess of a housing.

FIG. **17** shows another diagrammatic perspective view of an input tool being operated in a recess of a housing near a trackpad.

FIG. **18** shows a diagrammatic side section view of a housing recess and input tool.

FIG. **19** shows a diagrammatic side section view of a housing recess and input tool.

FIG. **21** shows a diagrammatic end section view of a housing and input tool with airflow passages in the housing.

FIG. **22** shows a diagrammatic end section view of a housing and input tool with a cover.

FIG. **23** shows a diagrammatic side section view of a housing recess and input tool.

DETAILED DESCRIPTION

Reference will now be made in detail to representative embodiments illustrated in the accompanying drawings. It should be understood that the following descriptions are not intended to limit the embodiments to one preferred embodiment. To the contrary, they are intended to cover alternatives, modifications, and equivalents as can be included within the spirit and scope of the described embodiments as defined by the appended claims.

Makers and users of electronic devices and systems are in constant need for user interface improvements to make them easier, more efficient, and more comfortable to use. Input devices such as touchscreens can beneficially achieve these goals by being adaptable and reconfigurable to the context and content of the user's utilization of the touchscreen electronic device. For example, some computing devices, such as laptop computers, can have a touch screen positioned in or adjacent to a keyboard of the device that can be configured to provide many more functions than a set of traditional keys. The touch screen can show information in addition to information shown on a main display screen, can simulate key-based typing inputs (and can change which keys are simulated and shown), can receive touch input and gesture input (e.g., one or more sliding touches) across its surface, and more.

However, an ancillary touch screen can be difficult to use in some cases. Touch typists may dislike using the touch screen because it lacks tactile feedback as compared to a set of mechanical, moving keys. The touch screen is also generally positioned near the user's hands and therefore may be prone to being obscured from the user's vision by their own hands. Also, even when the user looks at the touch screen, it is positioned at a different focal distance from the user as compared to the main display, so the user must readjust their head or eyes to effectively read and interact with the touch screen, particularly when the touch screen is positioned at a flat angle while the main display is not. Furthermore, as the benefits of stylus-based input for computing devices have become more and more apparent over time, the inclusion of an ancillary touch screen in the electronic device in addition to the stylus can make the device become overly complex, expensive, and difficult to use. Styluses can have touch sensitivity and display capability, so using a stylus and separate ancillary touch screen with the same device can be redundant.

Accordingly, aspects of the present disclosure relate to computing systems in which a computing device is configured to interact with an input tool, such as a stylus, that can be stored in or on a chassis or housing of the computing device. The input tool can be used as a first type of input device (e.g., a touch- or force-sensitive writing instrument) when it is removed from the chassis and can be used as a second type of input device (e.g., a touch-sensitive button, a touch pad, a set of simulated keyboard keys, or a mechanical input interface) when it is stored on or in the chassis. The input tool can be touch-sensitive at its outer surfaces in a manner that allows a user to tap, touch, or press the outside of the tool to provide a signal to the computing device whether or not the tool is mounted to the computing device. Also, in some cases, the input tool or chassis can comprise features for displaying information to a user, and the information can be visible to the user on or through the input tool when it is handheld or mounted to the chassis.

Accordingly, the input tool can be used to replace or replicate many of the functions and capabilities of an ancillary touch screen while also being able to provide separate stylus-like functionality, thereby reducing the redundancy, cost, and size of the computing system. The input tool can comprise an internal display or set of indicators that interacts and electrically communicates with a keyboard or other associated computing device when the tool is positioned in a socket or recess of the keyboard chassis, and the tool can therefore function similar to an ancillary touch screen or a set of keyboard keys when it is the socket or recess. Removing the tool from the chassis can change the function of the tool or change the meaning and function of its electrical and sensor signals so that it is operable as a stylus or wand input device.

These and other embodiments are discussed below with reference to FIGS. **1** through **23**. However, those skilled in the art will readily appreciate that the detailed description given herein with respect to these Figures is for explanatory purposes only and should not be construed as limiting.

FIG. **1** shows a block diagram of a computing system **100** including a chassis **102**, a computing device **104**, and an input tool **106**. The input tool **106** can be positionable relative to the chassis **102** in a first configuration **107** and a second configuration **108**. In the first configuration **107**, the tool **106** can be mounted to, held against, locked to, supported by, disposed within or attached to the chassis **102**. For example, a magnet or mechanical latch can hold the tool **106** to a portion of the chassis **102**. See, e.g., FIG. **18** and its related descriptions. In the second configuration **108**, the tool **106** can be spaced away from the chassis **102** or substantially spaced away from the chassis **102** (e.g., only the tip **110** or another small fraction of the tool **106** contacts a part of the chassis **102**). The tool **106** can also comprise a sensor **112** electrically connected to an electronic communication interface **114** of the tool **106**.

The computing system **100** can comprise a computer such as a laptop computer, tablet computer, desktop computer, or other device configured to receive input from an input tool **106** and associated with the chassis **102**. For example, the chassis **102** can be a housing or enclosure of a keyboard, notebook computer body, a tablet computer body, a computer accessory or case, or a similar device. The chassis **102** can contain the computing device **104** (e.g., when the chassis is part of a laptop computer) or the computing device **104** can be part of a separate component to which the device of the chassis **102** is connected (e.g., the computing device **104** is in a desktop or tablet computer housing and the chassis **102** is a keyboard electrically connected to the computer housing; see FIG. **2**).

The computing device **104** can comprise computer components enabled to receive and send electrical signals between component devices of the system **100** and to and from a user. For example, the computing device **104** can comprise a processor, memory device, electronic storage device, display screen, input adapter interface (e.g., to communicate with electronic communications interface **114** of the tool **106** or to connect to a keyboard), output adapter interface (e.g., to communicate and control a connected display screen), related components, or combinations thereof connected to each other via a bus interface. Accordingly, the computing device **104** can be enabled to electronically interface with the input tool **106** when it is in the first or second configuration **107**, **108** by receiving signals from (and potentially sending signals to) the input tool **106**.

In the first and second configurations **107**, **108** of the tool **106**, the sensor **112** of the tool **106** can sense or detect user input. For example, the sensor **112** can comprise an input device (e.g., a touch sensor or mechanical switch) that, when operated by a user, can generate a signal that is transmitted to the computing device **104** using the communications interface **114** or that is detected by the computing device **104** (e.g., using an antenna). Thus, a user can interact with the sensor **112** to provide an input signal **116** when the tool **106** is in the first configuration **107** or an input signal **118** in the second configuration **108**. The input signals **116**, **118** can be the same or different from each other. The tip **110** can also comprise a sensor that can be used to provide an input signal (e.g., **116** or **118**) via the communications interface **114** when the tip **110** is operated (e.g., touched or pressed against a surface) in the first or second configuration **107**, **108**.

In some embodiments, the input signals **116**, **118** sent to the computing device **104** can be identical. Accordingly, operations of the sensor **112** or tip **110** can send the same information to the computing device **104** whether the tool **106** is in the first or second configuration **107**, **108**. The computing device **104** can receive and react to the input signals **116**, **118** identically in either configuration **107**, **108**. For example, a touch detected by the sensor **112** can be treated as a mouse "click" input in both cases.

In some embodiments, the computing device **104** can receive or react to the input signals **116**, **118** differently. The computing device **104** can react differently to each input signal **116**, **118** by storing or displaying different information for the user for each input signal **116**, **118** or by interpreting the input signals **116**, **118** differently. Accordingly, different input signals **116**, **118** can cause different operations to be performed by the computing device **104**. For instance, one of the input signals **116**, **118** can be treated as a binary input (e.g., an on/off permanent or temporary toggle or switch), and the other signal can be treated as a graded or variable input (e.g., a measurement of force or position on the tool **106**). In some embodiments, one input signal **116**, **118** can be treated as a keyboard key input (e.g., a key-based typing input), and the other input signal can be treated as a remote control input for the computing device **104**. Additional variations and embodiments are described in connection with the following figures.

FIG. **2** shows a perspective view of a computing system **200** including a computing device **202** having a lower housing **204** and an upper housing **206**. In some embodiments, such as when the computing device **202** is a laptop or notebook computer, a hinge **208** joins the lower and upper housings **204**, **206**. In some embodiments, the lower and upper housings **204**, **206** can be separate components in electrical communication with each other by a wired or wireless interface, such as when the computing device **202** is a desktop or tablet computer and components in the housings **204**, **206**. Thus, at least one of the upper and lower housings **206**, **204** can contain a processor, memory, a battery, an electronic storage medium, a wireless electronic communications interface, a display, and other computer features and components typically found in a laptop or tablet computing device.

The upper housing **206** can include a display screen **210** in this embodiment. In some cases, the upper housing **206** can comprise components configured to sense and detect the presence of an input tool (i.e., **218**) at its surface, such as a touch sensor for detecting the presence of an input tool **218** touching the upper housing **206** at the display screen **210**.

The lower housing **204** can include a keyboard **212** having a set of keys, a substantially flat input area **214** (e.g., a touch-sensitive trackpad or digitizer/pen tablet region), and a tool retainer portion **216**. FIG. **3** shows a perspective view of the top of the lower housing **204**. As shown in FIGS. **2** and **3**, the lower housing **204** can have a top surface **220**, a front surface **222**, lateral side surfaces (e.g., **224**), and a back surface **226**. The input area **214** and tool retainer portion **216** can be positioned at the top surface **220**. In some embodiments, the tool retainer portion **216** can be located on another side (e.g., surface **222**, **224**, or **226**) of the lower housing **204**, as shown, for example, by tool retainer portion **228** in FIG. **3**. FIG. **3** also shows that the tool retainer portion **216** can be located at a back end of the lower housing **204**, wherein the tool retainer portion **216** is positioned between the keyboard **212** and the back surface **226** or hinge **208**. In some embodiments, the tool retainer portion **216** is positioned amid keys of the keyboard **212**, as shown by optional keys **230** in FIG. **3**. The tool retainer portion **216** can therefore have keyboard keys **230** positioned on two opposite sides of the tool retainer portion **216**. In some embodiments, the tool retainer portion **216** has keyboard keys (e.g., keys **230** and keyboard **212**) that are on three sides of the tool retainer portion **216**. The three sides of the retainer portion **216** can be positioned in three orthogonal directions from a center of the tool retainer portion **216**. Thus, the tool retainer portion **216** can hold an input tool **218** adjacent to or among a set of keyboard keys. This can be beneficial in making the input tool **218** easy to access and use when it is operated to provide key-based typing input and similar inputs as it is stored in the tool retainer portion **216**. See, e.g., FIG. **7** and its related descriptions.

The input tool **218** can comprise an elongated shape configured to be handheld by a user in a manner similar to a wand, stylus, or pencil while it is being used and separated from the lower housing **204**. Thus, in some embodiments, the input tool **218** can be referred to as having a rod- or pen-like shape. The input tool **218** can be referred to as being a user interface device or a computer input interface. FIGS. **4A-4C** show various embodiments of input tools **300**, **302**, **304** that can be used as input tool **218** with lower housing **204**.

Each input tool **300**, **302**, **304** can comprise a first end **306** and a second end **308** separated by an elongated body **310**. In some embodiments, at least one end **306**, **308** is touch- or force-sensitive, wherein a sensor in the input tool **300**, **302**, **304** is configured to transduce a force or touch applied to the end **306**, **308**. For example, the first end **306** can be force-sensitive to transduce pressure applied to the first end **306** when a user contacts the first end **306** to a surface in a writing or drawing movement. In some embodiments, the first end **306** can be tapered similar to a pen or pencil.

The elongated body **310** can contain electronic components within the input tool **300**, **302**, **304**. In some embodiments, the elongated body **310** contains a touch or force sensor (e.g., sensor **112**) configured to detect a capacitive touch or input force of a user object (e.g., a finger or appendage) against the outer surface of the elongated body **310** or one of the ends **306**, **308**. The touch or force sensor can be configured to detect a touch or force on various different portions of the input tool **300**, **302**, **304**. For example, as shown by input tool **300**, the input tool **300** can have a touch- or force-sensitive side input region **312** extending only partially along an overall length of the elongated body **310**. Accordingly, the input tool **300** can have a non-input segment **314** along a remainder of the elongated body **310**. The non-input segment **314** can be positioned along a portion of the elongated body **310** having parallel sides **316**, **318** (e.g., a cylindrical section or a polygonal prism section of the elongated body **310**).

In some embodiments, such as input tool **302**, the touch or force sensor can be configured to detect a touch or force on a full length of the elongated body **310**, as indicated by input region **320**. In some embodiments, an end input region **322** can also be included at at least one end **306**, **308**. Thus, the full length of the elongated body **310** (e.g., along the entire cylindrical or polygonal prism-shaped midsection of the input tool **302**) can be configured to receive an input touch or force. Furthermore, in some cases, the touch or force sensor can be configured to detect a position of the application of the touch or force against the outer surface of the elongated body **310**, wherein a longitudinal position (i.e., along axis X in FIG. **4**B) and a rotational/angular position (i.e., along direction Y in FIG. **4**B) can be determined by the sensor. In some embodiments, the sensor only detects one position (along X or Y). In some embodiments, the sensor only detects whether an input is being provided or not (i.e., it produces an on/off, binary-type signal).

In another embodiment, the input tool **304** can comprise a touch or force sensor that has an input region **324** with at least one middle section **326**, **328** that is not touch- or force-sensitive. A middle section **326**, **328** can be a location where other input is provided, such as positions of side buttons or switches on the input tool **304**. In some embodiments, a middle section **326**, **328** is positioned external to an inductive charging coil within the elongated body **310**. The coil can be used to provide electrical power to the input tool **304** when the tool **304** is mounted to a tool retainer portion **216**. See also FIG. **21**.

In some embodiments, the input tools **300**, **302**, **304** can comprise at least one display or internal light source. For example, the input regions **312**, **320**, **324** can comprise a display or light source (e.g., a touchscreen display). In some cases, a non-input segment **314** or **326**/**328** can comprise a display a light source or light guiding feature. In this manner, the display or internal light source can be used to provide or indicate information to a user through the surface of the input tool **300**, **302**, **304**. See also FIGS. **14**-**15**.

As shown in FIG. **2**, the tool retainer portion **216** of the lower housing **204** can comprise a recess, groove, or socket in which an input tool **218** can be held or secured. FIG. **5** shows a side section view of an example recess **500** in a housing **502** with an input tool **504** located in the recess **500**. The section view can be taken along section lines **5**-**5** in FIG. **3**. As shown in FIG. **5**, the recess **500** can have a bottom surface **506**, a front side surface **508**, and a rear side surface **510** that are positioned under and below a top surface **512**. The recess **500** can therefore have a generally rectangular-U-shaped cross-sectional profile in which the input tool **504** contacts the bottom surface **506** thereof. In some embodiments, the recess **500** can have two side surfaces, such as a recess with a generally V-shaped cross-sectional profile. In some embodiments, the recess **500** can have another cross-sectional shape, such a curve (e.g., a round profile or round U-shaped profile) or a profile having more than three side surfaces.

The input tool **504** can have a cross-sectional profile with a curved side surface **514** and a relatively flattened or planar side surface **516**. In some embodiments, the input tool **504** has an entirely round or elliptical cross-sectional profile. In some embodiments, the input tool **504** can have a polygonal cross-sectional profile, such as a hexagonal profile, as shown by input tool **600** in FIG. **6**. Various cross-sectional profiles can provide different grip features for the comfort and convenience of the user handling the input tool **500**/**600**. Additionally, different side surfaces can display different information to the user. For example, in input tool **600**, a top surface **602** can display one set of information (e.g., a first set of symbols or a first display screen), and side surfaces **604**, **606** can display other information (e.g., a second or third set of symbols or display screens). Each set of information can therefore be angularly offset or displaced from another set of information. In some embodiments, the information shown on one side (e.g., **602**) of the input tool **600** can also be displayed on a different side (e.g., **604**/**606** or bottom surface **608**) so that the input tool **600** can display the same amount or type of information to the user no matter which surface **602**, **604**, **606**, **608**, etc. is facing upward. Thus, multiple rotated orientations of the input tool **600** relative to the recess **500** can display different information (or different instances of the same information) to a user.

The input tool **504** can be positioned in the recess **500** with a curved surface **514** contacting one of the side surfaces of the recess **500**. In some embodiments, the input tool **504** can be positioned in the recess **500** with a planar side surface **516** contacting one of the side surfaces. With a planar side surface **516** contacting the recess **500**, the input tool **504** can be less able or unable to roll in the recess **500**. With a planar side surface **516** exposed and facing out of the recess **500**, information or a display on the planar side surface **516** can be more visible to a viewer while the input tool **504** is held in the recess **500**. With a curved surface contacting the recess **500**, the input tool **504** can be rolled or otherwise rotated relative to the recess **500** more easily. See also FIGS. **16**-**17** and their related descriptions.

The recess **500** can have a depth substantially equal to the thickness T of the input tool **504**. The thickness T can be a minimum thickness of the input tool **504** (as opposed to the diameter of the curved surface **514** which is larger than thickness T). In this manner, the top-most surface (e.g., **516**) of the input tool **504** can be substantially level with or at the same vertical position as the top surface **512** of the housing **502**. Thus, the input tool **504** can be positioned in the recess **500** without protruding from the top surface **512**. This can be beneficial to avoid contact between the input tool **504** and objects above the top surface **512**, such as when an upper housing (e.g., **202**) closes and the display screen (e.g., **210**) is positioned over the keyboard **212**.

In some embodiments, the recess **500** and input tool **504** can have dimensions wherein the top surface of the input tool **504** protrudes from the recess **500** to a height substantially equal to the height of the keys of the keyboard **212**. In this manner, the top surface of the input tool **504** can be comfortably positioned in the same horizontal plane as the keys so that the user does not need to reach higher or lower relative to the keys to reach and touch the input tool **504**. In some embodiments, the input tool **504** can have a top surface that is positioned below the plane of the top surface **512** of the housing. Thus, the input tool **504** can be placed in a manner less likely to be accidentally touched by the user or dislodged from the recess **500**.

FIG. **7** shows partial top views of a housing **700** having a recess **702** and a keyboard **704**. An input tool **706** is positioned longitudinally aligned with and within the recess **702**. The input tool **706** can have a pointed tip **708** positioned at one end of the recess **702** and a relatively flatter tip at the opposite end thereof. The length of the recess **702** can be larger than the total longitudinal length of the input tool **706** in order to accommodate the entire length of the input tool **706**. The width of the recess **702** (shown vertically in FIG. **7**) can also be sized to receive the width of the input tool **706**. A small gap or space can be formed between the outer limits of the input tool **706** and the inner limits of the recess **702**. A user can therefore use a finger to press down on the tip **708** to make the input tool **706** rotate out of the recess **702** and to be graspable by the user on its side surfaces.

The recess **702** can be positioned adjacent to the keyboard **704**, wherein at least portions of the input tool **706** are visible or accessible to the user as the user moves their hands across the keys to provide typing input. The recess **702** can be positioned parallel to a row of keys (e.g., the number-row keys, as shown in FIG. **7**). In some embodiments, the recess **702** can be parallel to a top row of keys of the keyboard **704** (e.g., the row of keys configured to be furthest from the user or the row of keys furthest from the spacebar). In some embodiments, the recess **702** can have a length substantially equal to a width of a set of keys of the keyboard **704**, such as a length equal to the width of about 10 keys to about 12 keys. Accordingly, in some embodiments, the recess **702** can receive an input tool **706** having a longitudinal length in a range of the width of about 9 keys to about 11 keys.

The size and position of the recess **702** and input tool **706** can enable the user to more easily interact with the input tool **706** while it is stored in the recess **702**. In some embodiments, touches applied to the input tool **706** can be sensed, detected, or transduced while it is stored in the recess **702**. Thus, while the input tool **706** is positioned in the recess **702**, the user can provide input to the input tool **706** in addition to providing input via the keyboard **704**. The input provided through the input tool **706** can be used, for example, to trigger a function of a key of a conventional keyboard that is missing from the keyboard **704** or that duplicates a function of the keyboard **704**. For example, the input tool **706** can comprise a surface **710** that, when touched or pressed by the user, is sensed as being a user input similar to a key function of a keyboard, such as one of the function keys (i.e., "F-keys", such as F**3**, shown in FIG. **7**). Contact with other portions of the surface of the input tool **706** can be detected and produce other outputs, such as the outputs of other function keys (e.g., F**1**, F**2**, etc.), system function controls (e.g., screen brightness, keyboard backlight brightness, volume controls, power, sleep, display settings, application settings (e.g., font, size, or color for a word processing or art application), etc.), or other conventional keyboard outputs (e.g., letters, symbols, modifier keys, etc.). As a result, the input tool **706** can be used to provide keyboard input similar to a row of keys while it is positioned in the recess **702**. When the user touches the same surface **710** while the input tool **706** is displaced from the recess **702**, the input can be ignored or can be interpreted differently (e.g., replicating a mouse "click").

A set of indicators **712** (e.g., words, letters, numbers, icons, shapes, lights, etc.) can be visible at the surface of the input tool **706** at least while it is positioned in the recess **702**. In some embodiments, the indicators **712** are recessed into or protrude from the surface of the input tool **706**. For example, the indicators **712** can be engraved into the input tool **706**. In some embodiments, the indicators **712** are displayed using a display screen (e.g., a touch screen) within the input tool **706** (see FIG. **14**). In other embodiments, the indicators **712** comprise a different material or color than the surrounding material of the input tool **706** (e.g., black or clear plastic indicators flush inset into a white plastic housing or metal indicators flush inset into a wooden housing) (see FIGS. **9**, **12**-**13**, and **15**). In further embodiments, the indicators **712** are visible due to light projected, reflected, or diffused onto the outer surface of the input tool **706** or light projected, reflected, or diffused through the material of the housing of the input tool **706** (see FIGS. **8**, **10**, **11**, and **15**).

FIG. **8** illustrates an end view of an example embodiment of a housing **800** having a recess **802** in which an input tool **804** is positioned. The housing **800** can comprise a light source **806** in a sidewall **808** of the recess **802**. The light source **806** can be configured to project light **810** against a side surface **812** of the input tool **804** that is reflected and diffused in a manner visible to the user. Accordingly, an indicator **712** can be generated by reflecting light from a light source **806** that is emitted onto a side surface of the input tool **706**.

In some embodiments, the light source **806** can comprise a laser, a light-emitting diode (LED) (e.g., a micro LED), a similar device, or combinations thereof. The light source **806** can be positioned in the recess **802** or can pass through a wall of the recess **802**. For example, the light source **806** can be used to backlight a keycap (e.g., for keyboard **704**), and some of the light from that backlight can be redirected (e.g., by a reflector, fiber optic, light guide, or similar feature) from beneath the keycap to the sidewall **808** of the recess **802**.

The light source **806** is shown at the top end of the recess **802** near the mouth thereof in FIG. **8**. The light source **806** can therefore be positioned at or above a top half of the input tool **804** (e.g., above mid-height line **814**). This can be beneficial for an input tool **804** having a generally rounded cross-sectional profile since the light **810** can be reflected in an upward direction and out of the recess **802** toward the user. In some embodiments, a light source **815** can be positioned below the midline of the tool **804** and can reflect light **816** around the lower portion of the recess **802** without reflecting directly upward or out of the recess **802**. In this manner, the recess **802** can have diffuse illumination that can help illuminate one or both elongated sides of the input tool **804** rather than having localized illumination or a specific symbol showing on the tool. In various embodiments, a plurality of light sources (e.g., **806**, **815**) can be spaced out along the length of the recess **802** to provide multiple points of illumination for the tool **804** and recess **802**. These multiple points can make the illumination of the tool **804** and recess **802** more even and consistent.

FIG. **9** shows another embodiment of a housing **900** having a recess **902** in which an input tool **904** is positioned. In this case, a light source **906** is positioned in a sidewall **908** of the housing **900**, and the input tool **904** comprises a transparent portion **910** and an opaque portion **912**. An internal reflective surface **914** can be located between the transparent portion **910** and the opaque portion **912**. Light **916** emitted from the light source **906** can be reflected from the reflective surface **914** and out of the recess **902** to a user's viewing position.

The reflective surface **914** can comprise a smooth, mirror-like finish of the transparent portion **910** or opaque portion **912** so that parallel light **916** is reflected at substantially the same angle from the reflective surface **914**. Accordingly, the light source **906** can beneficially be an array of light sources (e.g., an array of pixel lights or a display screen) configured to generate indicators (e.g., **716**) that are reflected from a mirror-like, flat surface (e.g., **914**) of the input tool **904**. The indicators can therefore have an appearance of being generated from within the input tool **904**. In some embodiments, the transparent portion **910** can be omitted, at least where the light source **906** is located, and the reflective surface **914** can be an external surface of the input tool **904**. The light source **906** can have a longitudinal length substantially equal to a length of the reflective surface **914** or a length of a touch-sensitive portion of the input tool **904**.

FIG. **10** shows another similar end view of a housing **1000** having a recess **1002** in which an input tool **1004** is located. An outer surface **1006** of the input tool **1004** can contact an inner surface **1008** of the recess **1002**. A light source **1010** in the recess **1002** can emit light **1012** into the outer surface **1006**, and the light **1012** can be diffused through the input tool **1004**. At the sides or top of the input tool **1004**, the light **1012** can make the surfaces of the input tool **1004** appear to glow or have its own internal light source. To do so, the input tool **1004** can comprise a translucent material configured to allow light to diffuse and pass through the input tool **1004** from the outer surface **1006** to surfaces viewable by the user.

In some embodiments, the input tool **1004** can comprise partially diffuse material, wherein some surfaces (e.g., top surface **1014**) can comprise a translucent material, and other surfaces (e.g., the sides of the tool) can comprise opaque material configured to prevent transmission of light from the light source **1010**. Accordingly, certain portions of the perimeter of the input tool **1004** can be internally illuminated by a light source **1010** that is external to the perimeter of the input tool **1004**.

FIG. **11** shows a diagram of a side view of a housing **1000** as viewed from section lines **11-11** in FIG. **3**. In some embodiments, multiple light sources **1010**, **1016**, **1018** can be configured to emit light into the input tool **1004** at different points along the length of the input tool **1004**. The input tool **1004** can therefore have multiple segments **1100**, **1102**, **1104** that each diffuse light received from a separate light source **1010**, **1016**, **1018**. In some embodiments, the input tool **1004** can comprise internal dividers **1106**, **1108** configured to reduce or prevent diffusing light from one segment (e.g., **1100**) into a neighboring segment (e.g., **1102**). In this manner, different functions or status indicators can be visually displayed by different segments **1100**, **1102**, **1104** of the input tool **1004**. For example, each segment **1100**, **1102**, **1104** can indicate a different feature of the computing device or can signify a different keyboard function that is performed when the segment **1100**, **1102**, **1104** is touched or pressed by the user. Using the light sources **1010**, **1016**, **1018**, the input tool **1004** does not need to have indicators (e.g., **712**) on its surface to be able to indicate that different inputs can be provided at each of the segments **1100**, **1102**, **1104** because the light passing through the input tool **1004** provides a visible indication for each segment.

FIG. **12** illustrates another end-facing section view of a housing **1200** having a recess **1202** containing an input tool **1204**. Similar to light source **1010** in FIG. **10**, a light source **1210** can contact an outer surface **1206** of the input tool **1204** and can emit light into the surface **1206** of the input tool **1204**. In this case, the light **1212** is emitted into a light guide portion **1214** of the input tool **1204** which extends through an external portion **1216** of the input tool **1204**. The light guide portion **1214** extends diametrically across the input tool **1204**. In some embodiments, the light guide portion **1214** can extend through a curved or angled path through the input tool **1204** that connects one outer surface **1206** to another, opposite outer surface **1217**.

The external portion **1216** can comprise an opaque material, and the light guide portion **1214** can comprise a transparent or translucent material. Thus, when light **1212** is emitted into the surface **1206**, the light **1212** can reflect or diffuse through the light guide portion **1214** before being visible at an outer surface (e.g., top surface **1217**) of the input tool **1204**. In some embodiments, the light guide portion **1214** can comprise a surface shape perimeter or geometry that forms at least one symbol or other indicator. Thus, light **1212** passing through the input tool **1204** can be emitted from a portion of the top surface **1217** that forms a shape or signal to the user such as an indicator **712**. In some embodiments, light can be internally reflected by sides of the light guide portion **1214** or external portion **1216** in order to preserve brightness of the light **1212** as it emerges from the top surface **1217**. Accordingly, the light guide portion **1214** can comprise a material configured for total internal reflection of the light **1212** that enters at the outer surface **1206** before it reaches the top surface **1217**.

FIG. **13** shows a diagrammatic side view of a housing **1300** having a recess **1302** containing an input tool **1304**. In this case, the input tool **1304** can comprise a set of light guides **1306**, **1308**, **1310**, **1312** that extend from a terminal end **1314** of the input tool **1304**, longitudinally through at least a portion of the length of the input tool **1304**, and end at or near a top surface **1316** of the input tool **1304**. A light source **1318** of the recess **1302** can emit light into the terminal end **1314**, and light can thereby enter the light guides **1306**, **1308**, **1310**, **1312** and can be directed through the light guides to the top surface **1316**. The ends of the light guides **1306**, **1308**, **1310**, **1312** at the top surface **1316** can be spaced apart to indicate different features and functions at different parts of the length of the top surface **1316**.

In some embodiments, a cap or retainer **1320** can be positioned between the terminal end **1314** and the light source **1318**, and the retainer **1320** can help direct light from the light source **1318** into the light guides **1306**, **1308**, **1310**, **1312**. In some cases, the light source **1318** can be positioned in the retainer **1320**. The retainer **1320** can have an inner surface that follows a contour or surface shape of the terminal end **1314** and can therefore help prevent leakage of light around the terminal end **1314**. For example, the retainer **1320** can have a surface having a radius of curvature that is substantially equal to a radius of curvature of the terminal end **1314** of the input tool **1304**.

Furthermore, in some embodiments, the retainer **1320** can apply pressure to the input tool **1304** to ensure tight-fitting contact between the terminal end **1314** and the retainer **1320**. For example, the retainer **1320** can comprise a resilient material configured to deflect when contacting the terminal end **1314** or the entire retainer **1320** can move relative to the recess **1302** (e.g., via a spring-loaded fitting) to come into contact with the input tool **1304**. The user can place the input tool **1304** into the recess **1302** and, with the same application of force, apply pressure to the retainer **1320** to move the retainer into a tight fit against the terminal end **1314**.

In some embodiments, the retainer **1320** can comprise electrical contacts configured to engage a connector of the input tool **1304**, thereby providing electrical power or other electrical data communication between the input tool **1304** and the housing **1300**. The electrical contacts can be radially spaced apart at the terminal end **1314** and on the retainer **1320** in a manner that allows electrical connection between the input tool **1304** and the retainer **1320** in multiple different orientations of the input tool **1304**.

FIG. **14** shows an end-facing section diagram of another embodiment of a housing **1400** having a recess **1402** in which an input tool **1404** is located. In this embodiment, the input tool **1404** can comprise an internal light source **1406**. The light source **1406** can comprise an LED, bulb, or similar light-producing device, and in some cases the light source **1406** can comprise a display screen (e.g., a backlit liquid crystal display (LCD), micro-LED or organic LED (OLED) display, or similar apparatus). The light source **1406** can emit light that is visible through an outer surface **1408** of the input tool **1404** and that is made visible to the user. The light source **1406** can be configured to display patterns, colors, shapes, symbols, or other indicators. In some embodiments, the light source **1406** is configured to duplicate or supplement information displayed on a main display (e.g., **210**).

In some embodiments, the light source **1406** is at the outer surface **1408** of the input tool **1404**, and in some cases, the light source **1406** is recessed below the outer surface **1408** or is covered by a transparent or translucent cover **1410** (e.g., a clear panel, lens, light diffuser, or related device). The outer surface **1408** in FIG. **14** is shown at the top of the input tool **1404** while the tool is located in the recess **1402** so that the top of the tool **1404** can be viewed by the user without the sides of the recess **1402** blocking line of sight. In some embodiments, the input tool **1404** can be rotated, and the outer surface **1408** can be positioned at a side or bottom of the input tool **1404**. The light emitted from the light source **1406** can emerge toward the sides **1412** or bottom **1414** of the recess **1402** to either restrict viewing of the light to certain viewing angles or to illuminate the recess **1402**. The internal light source **1406** can be powered by an internal energy storage device (e.g., a battery) of the input tool **1404** or can be powered by current induced via a wireless power transmission coil in the housing **1400**. See also FIG. **20** and its related descriptions herein. In some configurations, multiple light sources **1406** can be positioned along the length of the input tool **1404**.

FIG. **15** shows a diagrammatic side view of an electronic device **1500** having a transparent cover **1502**, a sensor array **1504**, and a display **1506**. The electronic device **1500** can be a computing device **202** of computing system **200**. The cover **1502** can protect the sensor array **1504** and display **1506** from being contacted by external objects (e.g., input tool **1508** or a user's appendage). The sensor array **1504** can be configured to sense the position or presence of an object (e.g., input tool **1508**) contacting or slightly above the cover **1502**. Thus, the sensor array **1504** can be a capacitive touch sensor array configured to detect a change in capacitance caused by an object at the cover **1502**. The display **1506** can comprise a set of light-emitting devices **1510** (e.g., OLED or micro-LED pixels) that emit light through the sensor array **1504** and cover **1502**. Alternatively, the display **1506** can comprise a backlit LCD or similar conventional display device.

The input tool **1508** can comprise an internal light source **1512** and a transparent or translucent tip portion **1514**. The display **1506** can emit a color or set of colors from the light-emitting devices **1510** that are positioned adjacent to or below the tip portion **1514** of the input tool **1508**. A signal representing the color or set of colors from the light-emitting devices **1510** adjacent to or below the tip portion **1514** can be transmitted from a device controller (e.g., **104**) to a receiver or controller of the input tool **1508** (e.g., via a wireless electronic communications interface **114**), and the signal can be used to control the color properties (e.g., hue, saturation, and brightness) of the light source **1512**. In some embodiments, the color properties of the light source **1512** can be controlled to be a reflection of the color properties of the light-emitting devices **1510**. For example, the light source **1512** can be controlled to emit light having a similar hue as the color of the devices **1510** or an average hue (or other representative hue) of multiple pixels or light-emitting devices **1510** in the display **1506**. As the input tool **1508** is moved relative to the display **1506**, the color properties of light emitted by the light source **1512** can be changed corresponding to different light-emitting devices **1510** that are in different adjacent parts of the display **1506**.

FIG. **16** shows a perspective view of an electronic device housing **1600** having a recess **1602** in which an input tool **1604** is located. The input tool **1604** can comprise a rounded outer surface **1606** that is touch-sensitive, similar to the embodiments of FIGS. **4A-4C** and other input tools described in connection with the other figures herein. The input tool **1604** can be configured to be rotatable about its longitudinal axis while positioned in the recess **1602**, as indicated by arrows **1608** and **1610**. The input tool **1604** can be prevented from rolling off of the housing **1600** by contacting side surfaces of the recess **1602** as it rotates. Alternatively, at least one counter-roller positioned in the housing **1600** can roll in contact with and beneath the input tool **1604** to help prevent the input tool **1604** from translating along the direction of motion of a user appendage **1611** moving along an axis **1612** perpendicular to the longitudinal axis of the input tool **1604**. Additionally, a retainer (e.g., **1320**) can keep the input tool **1604** from moving out of the recess **1602**.

As the input tool **1604** rotates about its longitudinal axis, a measurement device can measure and determine the amount or rate of angular displacement of the input tool **1604**. For example, the measurement device can comprise an inertial measurement unit (IMU) within the input tool **1604** can determine the amount of rotation by use of an accelerometer, gyroscope, or similar apparatus. Alternatively, rotation of a counter-roller or movement of an outer surface of the input tool **1604** can be measured by a sensor in the housing **1600**. In some embodiments, a touch-sensitive outer surface **1606** can track the position of an object (e.g., **1611**) relative to the outer surface **1606** as the input tool **1604** rotates, and the movement of the object across the outer surface **1606** can be used to determine the rotation of the input tool **1604**. For example, the circumferential distance that an object moves around the outer surface **1606** as the input tool **1604** rotates can be used to determine the angular displacement of the input tool **1604**.

The rotation of the input tool **1604** can be measured and tracked as a user input to the electronic device. In some embodiments, the rotation of the input tool **1604** can be used to control functions of an electronic device that are conventionally controlled by a rotatable wheel-like device, such as a mouse wheel that controls scrolling, zoom, or size adjustment functions. Rotation of the input tool **1604** can therefore cause the electronic device to perform those scrolling, zoom, or size adjustment functions. Furthermore, in some embodiments, rotation of the input tool **1604** can be used to adjust the position of a symbol or object displayed on a main display (e.g., **210**) of the electronic device. For instance, rotating the input tool **1604** about its longitudinal axis can cause a mouse or text cursor to move vertically across the main display.

In some embodiments, a sensor (e.g., a touch sensor) can track the position of an object (e.g., **1611**) as it moves relative to the outer surface **1606** of the input tool **1604** in a direction parallel to the longitudinal axis of the input tool **1604**, such as in directions **1614** and **1616** in FIG. **16**. The position of the object can be used to control scrolling, zoom, or size adjustment at a main display or other functions of an electronic device that are conventionally controlled by a mouse or scroll wheel. In some embodiments, movement of the object across the outer surface **1606** parallel to the longitudinal axis of the input tool **1604** can cause a mouse or text cursor to move horizontally across a main display. Accordingly, rotation of the input tool **1604** can provide a first type of control signal to the electronic device (e.g., moving a cursor or scrolling vertically), and translation of a user object relative to the outer surface **1606** can provide a second type of control signal to the electronic device (e.g., moving a cursor or scrolling horizontally). The movement of the input tool **1604** can be confined to the limits of the recess **1602**, thereby making the input tool **1604** a compact scrolling or pointing input device that is alternatively usable as a writing, drawing, or pointing tool when removed from the recess **1602**.

The recess **1602** can be positioned at various locations on the housing **1600**. In some cases, the recess **1602** can be located at an end of, or along a side of, a keyboard, similar to the recess **702** of FIG. **7**. FIG. **17** shows an embodiment wherein the recess **1602** is located adjacent to a trackpad **1700** touch input device. A user object can provide touch input to the trackpad **1700** to control the electronic device. In addition, the same user object can provide touch or rotational input to the input tool **1604** in the recess **1602**.

The input provided to each input device **1700**, **1604** can have a substantially similar function (e.g., both can control cursor movement), can supplement each other, or can be used for separate functions. For example, a motion of the user object detected by the trackpad **1700** can be supplemented when a user object causes movement of the input tool **1604**. One user object (e.g., one hand of the user) can provide input to the trackpad **1700** while the another object (e.g., their other hand) can provide input to the input tool **1604**. Accordingly, multiple functions of the electronic device can be controlled independently and simultaneously by the trackpad **1700** and input tool **1604**.

Furthermore, in some cases, a motion of a user object can be continued across each input device **1700**, **1604**. For example, when a user performs an upward sliding movement across the trackpad **1700** (e.g., along arrow **1702**) with a user object, the object can transition from contacting the trackpad **1700** and engage contact with the input tool **1604**, thereby rotating the input tool **1604** about its longitudinal axis, as indicated by arrow **1704**. Thus, providing input to the input tool **1604** can effectively extend a gesture or touch input provided to the trackpad **1700**. A cursor moving upward on a display (as the user object moves along arrow **1702**) can continue to move upward as the input tool **1604** begins to rotate due to the user object coming into contact with the input tool **1604** at the edge **1706** of the trackpad **1700**. Similarly, a diagonal swiping movement (i.e., along arrow **1708**) of a user object on the trackpad **1700** can be continued as the user object reaches the edge **1706** and rotates the input tool **1604** while moving longitudinally parallel to the axis of the input tool **1604**, as indicated by arrows **1704** and **1710**.

Moreover, input that is provided to the input tool **1604** can be continued or extended as the user object transitions from the input tool **1604** to the trackpad **1700**. A rotational movement of the input tool **1604** (e.g., arrow **1712**) followed by linear movement across the trackpad **1700** (e.g., arrow **1714**) can result in a continuous result on a display screen, such as a continuous vertical movement of a cursor or continuous vertical scrolling. Similarly, rotational and lateral movement of the user object on the input tool **1604** as indicated by arrows **1712** and **1716** that is followed by movement of the user object on the trackpad **1700** along arrow **1718** can result in continuous diagonal movement of an object on a main display.

In some embodiments, the input tool can be used to provide feedback to a user or can have features by which it is retained to the housing. FIG. **18** shows a diagrammatic side view of a housing **1800** having a recess **1802** in which an input tool **1804** is located. The input tool **1804** can comprise a magnetic element **1806**, and the recess **1802** can comprise a magnetic element **1808** configured to be paired with and located adjacent to the magnetic element **1806** of the input tool **1804**.

The magnetic elements **1806**, **1808** can comprise magnetic or magnetizable materials that are magnetically attracted to each other, thereby providing a force attracting the input tool **1804** into the recess **1802** and helping to retain the input tool **1804** in the recess **1802** while it is not being carried by the user. For example, the magnetic elements **1806**, **1808** can comprise a permanent magnet, an electromagnet, a semi-permanent magnet (i.e., a magnet with reversible polarity), a ferrous/magnetically attracted material, or a similar apparatus or material. Accordingly, the magnetic elements **1806**, **1808** can magnetically hold the input tool **1804** to the housing **1800**.

In some embodiments, a housing magnetic element **1808** can be positioned in the housing **1800** separate from the recess **1802**, such as being within a tool retainer portion (e.g., **228**) on a front, side, or top surface (e.g., **222**, **224**, **220**) of the housing **1800**. See also FIG. **2**. For example, a magnetic element **1810** can be positioned at a front outer surface **222** of lower housing **204**.

At least one of the magnetic elements **1806**, **1808** can also be connected to a feedback driver. For example, as shown in FIG. **18**, the housing magnetic element **1808** can be connected to haptic driver **1812**. In some embodiments, the tool magnetic element **1806** can also be connected to a haptic driver in the input tool **1804**. The haptic driver **1812** can comprise a winding, a coil, an additional magnetic element, a motor, a piezoelectric driver, a vibrator, or another structure configured to move one of the magnetic elements **1806**, **1808**, the housing **1800**, or the input tool **1804**. In some embodiments, the feedback driver can comprise a visual or audible indicator configured to produce a feedback indicator that is visible or audible to a user, such as a light source **1512**. Furthermore, in some embodiments a magnetic element **1806**, **1808** can comprise temporarily reversible polarity, and the computing system can be configured to change the polarity of one or both magnetic elements **1806**, **1808** to repel each other and to help eject the input tool **1804** from the recess **1802**. For example, a magnetic element **1806**, **1808** can comprise an aluminum-nickel-cobalt (Al—Ni—Co) magnetic structure enabled to have its polarity reversed in response to application of an input electrical signal to the magnetic element. A magnetic element with reversible polarity can be used to repel the input tool **1804** from the recess **1802**.

In some embodiments, when the input tool **1804** is located in the recess **1802** and a user object **1814** (e.g., appendage) contacts, is detected by, or applies a force to the input tool **1804**, the feedback driver (e.g., **1812**) can produce feedback for the user. For example, when a user presses the input tool **1804** into the bottom of the recess **1802**, the haptic driver **1812** can produce a haptic output that slightly shakes, vibrates, pulses, or otherwise drives movement of the input tool **1804** relative to the recess **1802**. In some embodiments, the haptic driver **1812** can apply a magnetic force to the tool magnetic element **1806** to cause the input tool **1804** to move. Similarly, the feedback driver can provide a visual or audible feedback indicator to the user (e.g., production of light or sound). In some embodiments, the feedback driver's feedback is actuated by application of a threshold amount of force applied to the input tool **1804** by the user object. In this manner, the output of the feedback driver can be provided only when the user presses against the input tool **1804** with a force in excess of the threshold. Alternatively, one type of feedback can be provided when a force below the threshold is applied (e.g., a small vibration or emission of light), and a second type of feedback can be provided when a force exceeding the threshold is applied (e.g., a heavier vibration, brighter light, or audible noise).

When a haptic feedback is produced using the haptic driver **1812**, the input tool **1804** can be moved parallel to a longitudinal axis **1816** or in a radial direction **1818** relative to the longitudinal axis **1816**. Thus, in some cases the haptic feedback force can drive movement of the input tool **1804** in a direction substantially perpendicular to a direction of the input force applied by the user object **1814**, parallel to the length of the recess **1802**, or parallel to the longitudinal axis **1816** of the input tool **1804**.

Furthermore, in some cases the magnetic elements **1806**, **1808** can be configured to transduce movement of the input tool **1804** relative to the housing **1800** or to transduce a force applied along the longitudinal axis **1816**. For example, a user object **1814** can apply a force at least partially directed parallel to the longitudinal axis **1816** of the input tool **1804**, and the magnitude of the force component that is parallel to the longitudinal axis **1816**, or the sliding movement of the input tool **1804** relative to the recess **1802**, can be detected or measured as a type of user input to the input tool **1804**. In some embodiments, when the input tool **1804** has moved in this manner, the magnetic elements **1806**, **1808** can then bias the input tool **1804** back to a default position in the recess **1802**, thereby allowing the user to repeat the sliding input again, similar to how a mouse button returns to a default position after it has been "clicked". Accordingly, the input tool **1804** can laterally or longitudinally translate or deflect to "click" in addition to rotating or providing haptic feedback when contacted or pressed by a user.

FIG. **19** shows another embodiment of a housing **1900** having a recess **1902** containing an input tool **1904**. In this embodiment, the input tool **1904** comprises an internal feedback driver **1906** and a sensor **1908** configured to detect a user object **1909** contacting or applying a force to the outer surface **1910** of the input tool **1904**. The sensor **1908** can be a sensor **112** described in connection with FIG. **1**. The feedback driver **1906** can comprise a haptic, audible, or visual feedback generator configured to actuate in response to a signal generated by the sensor **1908** (or a connected controller) when the user object **1909** is detected. For example, in some embodiments, the feedback driver **1906** can be a light source (e.g., **1512**). The feedback driver **1906** can therefore indicate to the user (via feel, sight, or sound generated within the input tool **1904**) that the sensor **1908** has detected the user object **1909** or an action performed by the user object **1909**. Furthermore, when the input tool **1904** is separated from the housing **1900**, the feedback driver **1906** can be used to generate feedback in response to other user inputs to the input tool **1904**, such as touching or pressing against the outer surface **1910**, pressure against the tip **1912**, or reorientation of the input tool **1904** in space (e.g., via an IMU; see FIG. **23**).

FIG. **20** provides a diagrammatic end view of a housing **2000** having a recess **2002** in which an input tool **2004** is located. The housing **2000** can comprise an inductive winding or coil **2006** adjacent to a bottom surface **2008** of the recess **2002**. In some embodiments, the coil **2006** can be located in a side surface of the recess **2002**. The input tool **2004** can comprise a corresponding winding or coil **2010** configured to be positioned proximate to the surface **2008** in which the housing coil **2006** is positioned. These coils **2006**, **2010** can be paired to provide current to the input tool **2004** via induction, and the current can be used to power electronic components in the input tool **2004**, such as to charge a battery or power a display (e.g., **1406**) in the input tool **2004**.

In some embodiments, the input tool **2004** can comprise an additional coil **2012** configured to be used in place of, or to supplement, the other tool coil **2010**. Thus, the input tool **2004** can receive current by approximating a first side surface **2014** with the bottom surface **2008** and thereby positioning the first coil **2010** within current-generating range of the housing coil **2006**. The input tool **2004** can alternatively receive current by approximating the opposite side **2016** to the bottom surface **2008** and thereby positioning the second coil **2012** within range of housing coil **2006**. In this manner, the input tool **2004** can have multiple different orientations relative to the recess **2002** in which the input tool **2004** can receive current. In some embodiments, multiple coils can be positioned in the housing **2000**, and the input tool **2004** can comprise one coil that is configured to be positioned near one of the multiple housing coils. Moreover, the housing **2000** and input tool **2004** can each comprise multiple coils for an even greater number of possible working positions.

FIG. **21** shows a diagrammatic end view of a housing **2100** of an electronic device having a recess **2102** containing an input tool **2104**. In this embodiment, the input tool **2104** can be used as an airflow guide for the housing **2100**. For instance, the housing **2100** can comprise an exhaust passage **2106** with an exhaust opening **2108** linking the exhaust passage **2106** to the recess **2102**. Airflow through the exhaust passage **2106** can be driven via a fan **2110** or other airflow driver (e.g., convection) through the opening **2108** and into the recess **2102**. The airflow can be directed upward and out of the recess **2102** rather than passing mainly horizontally from the opening **2108** due to the airflow coming into contact with and being redirected by a side surface **2112** of the input tool **2104**. Accordingly, the presence of the input tool **2104** can help improve directing heated air away from the housing **2100**.

Additionally, in some embodiments, the housing **2100** can comprise an intake opening **2114** that leads to an intake passage **2116**. Airflow can be drawn by a fan **2118** or other airflow driver through the opening **2114** and into the intake passage **2116**. For example, the fan **2118** can draw cool external air into the housing **2100** to cool internal components of the electronic device. The input tool **2104** can comprise a side surface **2120** configured to help direct airflow that comes from a position outside the recess **2102** into the intake opening **2114**. In some embodiments, the fans **2110**, **2118** can be a single fan configured to provide both exhaust and intake flow.

Furthermore, in some embodiments, the housing **2100** can comprise both an exhaust opening **2108** and an intake opening **2114**, and the input tool **2104** can beneficially block the direct passage of airflow from one opening **2108** to the other opening **2114**. In other words, the intake opening **2114** can face the exhaust opening **2108**, and the input tool **2104** can comprise a surface positioned directly between the openings **2114**, **2108** in a manner that prevents flow along a linear path between the openings **2114**, **2108**. The bifurcation of the recess **2102** and airflow into and out of the recess **2102** can help ensure that cooler air passes into the intake opening **2114** and that warmer air passes from the exhaust opening **2108**, thereby improving the efficiency of the cooling system of the electronic device. More efficient flow paths around the input tool **2104** can allow the recess **2102** to have smaller (e.g., less visible and less susceptible to intake of debris) airflow openings.

FIG. **22** shows a diagrammatic end view of another embodiment of a housing **2200** having a recess **2202** holding an input tool **2204**. A cover **2206** can be positioned at the top end of the recess **2202** or above the recess **2202** to reduce or eliminate visibility of the inside of the recess **2202** when the cover **2206** is closed and to help retain the input tool **2204** in the recess **2202**. In some embodiments, the cover **2206** can be translucent or transparent to allow light coming from the input tool **2204** or within the recess **2202** to be visible external to the cover **2206**. In some embodiments, the cover **2206** can comprise a material and thickness that enables the input tool **2204** to detect a user touch applied to the cover **2206**. For example, the cover **2206** can comprise a material that is substantially transparent to or that transfers an electric field generated by a user object (e.g., a finger) contacting the cover **2206**, and the input tool **2204** can therefore sense the object from the opposite side of the cover **2206**.

The cover **2206** can be connected to the housing **2200**, for example, by a hinge **2208**. The hinge **2208** can allow the cover **2206** to pivot relative to the housing **2200**, such as by allowing the cover **2206** to pivot to the position at indicator numeral **2210**. Accordingly, the cover **2206** can move about the hinge **2208** to expose or cover the input tool **2204** and recess **2202**. Exposing the recess **2202** can enable the user to insert or remove the input tool **2204**, and covering the recess **2202** can limit access to the input tool **2204** and provide additional security in retaining the input tool **2204** to the housing.

In some embodiments, the cover **2206** and input tool **2204** can be reversibly attachable and detachable from each other, wherein the input tool **2204** can be attached to the cover **2206** and can move with the cover as it rotates, as indicated by indicator **2212**. Thus, the input tool **2204** can move relative to the recess **2202** as the cover **2206** moves relative to the housing **2200**. Additionally, the input tool **2204** can be attachable to the cover **2206** when the cover **2206** is in an open configuration (i.e., at **2210**) so that the cover **2206** stows the input tool **2204** in the recess **2202** as the cover **2206** moves to the closed configuration. In some embodiments, the cover **2206** is not attached to the input tool **2204**, and movement of the cover **2206** relative to the housing **2200** can actuate or manipulate a mechanism in the housing **2200** that pushes the input tool **2204** or otherwise ejects it out of the recess **2202**, thereby making it easier for the user to remove the input tool **2204** from the recess **2202**. For example, rotating the cover **2206** can actuate an electromagnet (e.g., **1808**) to eject the input tool **2204** from the recess **2202**.

FIG. **23** illustrates another diagrammatic side view of a housing **2300** having a recess **2302** holding an input tool **2304**. This input tool **2304** is shown with an inertial measurement unit (IMU) **2306** configured to transduce translation or rotation of the input tool **2304**. For instance, the IMU **2306** can track rotation of the input tool **2304** about its longitudinal axis in a manner similar to an IMU of input tool **1604**. The IMU **2306** can also be used to track tilt and translation of the input tool **2304**. Thus, output signals of the IMU **2306** can be used to determine whether the input tool **2304** is positioned external to or within the recess **2302** or whether or not the tool **2304** is positioned on a flat surface. When the input tool **2304** is tilted or determined to be outside a recess **2302** or out of contact with the housing **2300**, the input tool **2304** can provide a first type of functionality, such as functionality similar to a pen input device, input tool **1508**, and a first set of touch signals when a user touches or presses against the outer surface of the input tool **2304**. When the input tool **2304** is contacting the recess **2302**, lying on a horizontal surface, or against a housing **2300**, it can provide a different type of functionality, such as functionality similar to the input tools described in connection with FIGS. **5-14** and **16-22**. Accordingly, tracking the position and orientation of the input tool **2304** can control how movements and inputs provided to the input tool **2304** are interpreted by a controller.

In some cases, the input tool **2304** can be used as a wand-like device to provide inputs to an electronic device (e.g., via gesture control using the input tool **2304**). The position and orientation of the input tool **2304** can be used as inputs to control applications and features of the electronic device. Furthermore, the electronic device can comprise tracking components to supplement or enhance the position and orientation tracking of the input tool **2304**. For example, the electronic device can comprise an infrared emitter/receiver or a camera configured to detect the input tool **2304** in space relative to the housing of the electronic device. Movement of the input tool **2304** while being detected by the sensors of the electronic device can improve the determination of the position and orientation of the input tool **2304** using the IMU **2306**. In some embodiments, the recess **2302** can comprise a sensor to detect the presence of the input tool **2304** in a manner supplementing the output of the IMU **2306** to determine the orientation of the input tool **2304** within the recess **2302**.

Referring again to FIG. **2**, the computing system **200** can comprise a display screen **210** used to display graphical information to a user. In some embodiments, the positioning or detection of the input tool **218** relative to the lower housing **204** (e.g., relative to a tool retainer portion **216**) can affect the provision of information via the display screen **210**. For example, a first piece of information **250** can be shown on the display screen **210** when the input tool **218** is retained in or detected in the tool retainer portion **216**. Upon removal of the input tool **218** from the lower housing **204**, the first piece of information **250** can be replaced or added to by a second piece of information **252** on the display screen **210**. Thus, movement of the input tool **218** relative to the lower housing **204** or relative to the tool retainer portion **216** can cause a change in the information displayed by the display screen **210**. In some embodiments, the display screen **210** can show neither the first nor second pieces of information **250**, **252**, and movement of the input tool **218** can initiate the display of one or both pieces of information **250**, **252**.

In some embodiments, pieces of information **250**, **252** shown on the display screen **210** can include a menu or set of graphical symbols indicating a status of the input tool **218**. For example, movement of the input tool **218** can cause the computing system **200** to display information regarding the battery state of charge or other information about the settings or features of the input tool **218**. The information **250**, **252** can be shown persistently or temporarily on the display screen **210**.

In some embodiments, the computing system **200** can detect the presence of a user object adjacent to the tool retainer portion **216**. For example, the input tool **218** can comprise a capacitive or motion sensor (e.g., an infrared emitter/receiver) configured to detect the presence of an appendage of the user over the tool retainer portion **216**. The input tool **218** can be positioned in the tool retainer portion **216** when the user object is detected. Upon detection of the user object using a sensor of the lower housing **204**, in the tool retainer portion **216**, or of the input tool **218**, the computing system **200** can be configured to display a piece of information **250** or **252** on the display screen **210**.

In some embodiments, the information **250**/**252** shown can indicate a function of the computing system **200** that will be enabled or actuated upon the user object making contact with (or applying sufficient force to) the input tool **218** while it is in the tool retainer portion **216**. For example, an input tool **218** can display a duplicate set of the set of indicators **712** across the display screen **210** as part of the information **252**. In some embodiments, no indicators **712** are provided on the input tool **218**, and the indicators **712** are instead only shown in the information **252** on the display screen **210**. In some embodiments, indicators **712** are provided on the input tool **218**, and supplementary or secondary functions of the input tool **218** are shown in the information **252** on the display screen **210**. In some embodiments, removing the user object from proximity to the tool retainer portion **216** (e.g., moving it over the keyboard **212** or away from the lower housing **204** entirely) can change or remove the information **250**, **252** shown on the display screen **210**.

In some embodiments, the position of the user object relative to the tool retainer portion **216** can be detected, and the information **250**/**252** shown can be controlled as a reflection of the position of the user object. For example, if the user object is positioned adjacent to the left end of the input tool **218**, the left end of a menu of information **252** can be highlighted. Similarly, the position of the display of information **250**/**252** can move according to the position of the user object relative to the input tool **218**.

Furthermore, in some embodiments, the input area **214** can comprise an internal display or indicator **254**. The input tool **218** can be used to provide input at the input area **214**, such as by tapping or swiping on the input area **214**. In some embodiments, information displayed on the internal display or indicator **254** can change in response to the operation of the input tool **218** on the input area **214**. For example, a user may making a writing motion on the input area **214** with the input tool **218**, and the display or indicator **254** can display a line as if the user were writing on the input area **214**. The information shown by the internal display or indicator **254** can change (e.g., being activated or deactivated) based on the status and position of the input tool **218** relative to the tool retainer portion **216**. For example, the internal display or indicator **254** can be dimmed or off when the input tool **218** is stowed at the tool retainer portion **216**, and the internal display or indicator **254** can be brightened or show different information when the input tool **218** is removed from the tool retainer portion **216** or when the input tool **218** is detected or determined to be positioned adjacent to the input area **214**.

Features and aspects of the input devices and housings described in connection with one embodiment of the present disclosure can be combined with or replaced by features and aspects of other embodiments disclosed herein. Accordingly, the embodiments described herein can be used in many different combinations and permutations to obtain a variety of computing systems and input devices that are not described in connection with a single figure or numerical indicator herein.

To the extent applicable to the present technology, gathering and use of data available from various sources can be used to improve the delivery to users of invitational content or any other content that may be of interest to them. The present disclosure contemplates that in some instances, this gathered data may include personal information data that uniquely identifies or can be used to contact or locate a specific person. Such personal information data can include demographic data, location-based data, telephone numbers, email addresses, TWITTER® ID's, home addresses, data or records relating to a user's health or level of fitness (e.g., vital signs measurements, medication information, exercise information), date of birth, or any other identifying or personal information.

The present disclosure recognizes that the use of such personal information data, in the present technology, can be used to the benefit of users. For example, the personal information data can be used to deliver targeted content that is of greater interest to the user. Accordingly, use of such personal information data enables users to calculated control of the delivered content. Further, other uses for personal information data that benefit the user are also contemplated by the present disclosure. For instance, health and fitness data may be used to provide insights into a user's general wellness, or may be used as positive feedback to individuals using technology to pursue wellness goals.

The present disclosure contemplates that the entities responsible for the collection, analysis, disclosure, transfer, storage, or other use of such personal information data will comply with well-established privacy policies and/or privacy practices. In particular, such entities should implement and consistently use privacy policies and practices that are generally recognized as meeting or exceeding industry or governmental requirements for maintaining personal information data private and secure. Such policies should be easily accessible by users, and should be updated as the collection and/or use of data changes. Personal information from users should be collected for legitimate and reasonable uses of the entity and not shared or sold outside of those legitimate uses. Further, such collection/sharing should occur after receiving the informed consent of the users. Additionally, such entities should consider taking any needed steps for safeguarding and securing access to such personal information data and ensuring that others with access to the personal information data adhere to their privacy policies and procedures. Further, such entities can subject themselves to evaluation by third parties to certify their adherence to widely accepted privacy policies and practices. In addition, policies and practices should be adapted for the particular types of personal information data being collected and/or accessed and adapted to applicable laws and standards, including jurisdiction-specific considerations. For instance, in the US, collection of or access to certain health data may be governed by federal and/or state laws, such as the Health Insurance Portability and Accountability Act (HIPAA); whereas health data in other countries may be subject to other regulations and policies and should be handled accordingly. Hence different privacy practices should be maintained for different personal data types in each country.

Despite the foregoing, the present disclosure also contemplates embodiments in which users selectively block the use of, or access to, personal information data. That is, the present disclosure contemplates that hardware and/or software elements can be provided to prevent or block access to such personal information data. For example, in the case of advertisement delivery services, the present technology can be configured to allow users to select to "opt in" or "opt out" of participation in the collection of personal information data during registration for services or anytime thereafter. In another example, users can select not to provide mood-associated data for targeted content delivery services. In yet another example, users can select to limit the length of time mood-associated data is maintained or entirely prohibit the development of a baseline mood profile. In addition to providing "opt in" and "opt out" options, the present disclosure contemplates providing notifications relating to the access or use of personal information. For instance, a user may be notified upon downloading an app that their personal information data will be accessed and then reminded again just before personal information data is accessed by the app.

Moreover, it is the intent of the present disclosure that personal information data should be managed and handled in a way to minimize risks of unintentional or unauthorized access or use. Risk can be minimized by limiting the collection of data and deleting data once it is no longer needed. In addition, and when applicable, including in certain health related applications, data de-identification can be used to protect a user's privacy. De-identification may be facilitated, when appropriate, by removing specific identifiers (e.g., date of birth, etc.), controlling the amount or specificity of data stored (e.g., collecting location data a city level rather than at an address level), controlling how data is stored (e.g., aggregating data across users), and/or other methods.

Therefore, although the present disclosure broadly covers use of personal information data to implement one or more various disclosed embodiments, the present disclosure also contemplates that the various embodiments can also be implemented without the need for accessing such personal information data. That is, the various embodiments of the present technology are not rendered inoperable due to the lack of all or a portion of such personal information data. For example, content can be selected and delivered to users by inferring preferences based on non-personal information data or a bare minimum amount of personal information, such as the content being requested by the device associated with a user, other non-personal information available to the content delivery services, or publicly available information.

The foregoing description, for purposes of explanation, used specific nomenclature to provide a thorough understanding of the described embodiments. However, it will be apparent to one skilled in the art that the specific details are not required in order to practice the described embodiments. Thus, the foregoing descriptions of the specific embodiments described herein are presented for purposes of illustration and description. They are not target to be exhaustive or to limit the embodiments to the precise forms disclosed. It will be apparent to one of ordinary skill in the art that many modifications and variations are possible in view of the above teachings.

What is claimed is:

1. A computing device system, comprising:

a computing device including:

a housing having a surface; and

a first magnetic element positioned in the housing;

an input tool mountable to the surface of the housing and having a second magnetic element magnetically attractable to the first magnetic element to retain the input tool to the surface of the housing; and

a haptic driver connected to at least one magnetic element of the first magnetic element or the second magnetic element, the haptic driver being operable to move the at least one magnetic element in response to detecting an input force or touch applied to the input tool and induce movement of the input tool relative to the housing, wherein the input force or touch is substantially perpendicular to a longitudinal axis of the input tool.

2. The computing device system of claim **1**, wherein the input tool includes a sensor to transduce the force or touch applied to the input tool, wherein the haptic driver is operable to move the at least one magnetic element in response to a signal sensed by the sensor.

3. The computing device system of claim **1**, wherein the surface of the housing is positioned in a recess defined by the housing.

4. The computing device system of claim **1**, wherein the haptic driver comprises a coil, a third magnetic element, a motor, a piezoelectric driver, or a vibrator controllable by the computing device.

5. The computing device system of claim **1**, wherein the at least one magnetic element comprises a structure having reversible magnetic polarity, and wherein the haptic driver is controllable to reverse polarity of the structure.

6. The computing device system of claim **1**, wherein the haptic driver is configured to repel the input tool from the housing.

7. The computing device system of claim **1**, wherein the movement of the input tool relative to the housing is in a direction parallel to the longitudinal axis of the input tool.

8. The computing device system of claim **1**, wherein the haptic driver is configured to induce a movement of the input tool relative to the housing in a radial direction relative to the longitudinal axis of the input tool.

9. The computing device system of claim **1**, wherein the haptic driver is configured to produce an audible indicator.

10. A computing input device system, comprising:

an input tool including a first magnetic element; and

a computing device having a housing, a processor, a memory device, and a second magnetic element configured to magnetically attract the first magnetic element to a first position, wherein in the first position, the input tool contacts the housing;

wherein the memory device includes electronic instructions encoded thereon that, when executed by the processor, cause the processor to detect a movement of the input tool from the first position to a second position in response to a force applied by a user object, wherein in the second position, the input tool contacts the housing.

11. The computing input device system of claim **10**, wherein the movement is a sliding movement against the housing.

12. The computing input device system of claim **10**, wherein the input tool is biased from the second position to the first position by the first magnetic element and the second magnetic element.

13. The computing input device system of claim **10**, wherein the movement is at least partially directed parallel to a longitudinal axis of the input tool.

14. The computing input device system of claim **10**, wherein the movement is a lateral movement relative to a longitudinal axis of the input tool.

15. The computing input device system of claim **10**, wherein the housing includes a recess, the input tool is positioned in the recess while in the first position, and the input tool is positioned in the recess while in the second position.

16. An input device feedback system, comprising:

a chassis;

a computing device;

an input tool including a sensor and a feedback driver, the input tool being positionable relative to the chassis in a first configuration and a second configuration, wherein:

in the first configuration, the input tool is spaced away from the chassis and the feedback driver is configured to detect a first input provided to the input tool by a user of the input tool via the sensor of the input tool and, in response to the first input, output a first signal;

in the second configuration, the input tool contacts the chassis and the feedback driver is configured to detect a second input provided to the input tool by the user via the sensor of the input tool and, in response to the second input, output a second signal, the first signal being unique relative to the second signal.

17. The input device feedback system of claim **16**, wherein the feedback driver is configured to output visual feedback.

18. The input device feedback system of claim **16**, wherein the feedback driver is configured to output haptic feedback.

19. The input device feedback system of claim **16**, wherein the first input or the second input is a touch on a surface of the input tool and the sensor is configured to detect the touch on the surface of the input tool.

20. The input device feedback system of claim **16**, wherein the sensor comprises a first sensor and a second sensor separate from the first sensor, wherein the first input is provided to the first sensor, and wherein the second input is provided to the second sensor.

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