(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 716 226 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
30.09.2020 Bulletin 2020/40

(51) Int Cl.:
G07C 9/00 *(2020.01)* ***G07B 15/06*** *(2011.01)*

(21) Application number: **19201757.2**

(22) Date of filing: **07.10.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **27.03.2019 US 201962824946 P**

(71) Applicant: **VM Consolidated, Inc.**
Mesa, AZ 85201 (US)

(72) Inventors:
- **RIES, Michael W.**
  Gilbert, AZ Arizona 85298 (US)
- **STAHL, James D.**
  Bronx, NY New York 10470 (US)

(74) Representative: **Gill Jennings & Every LLP**
The Broadgate Tower
20 Primrose Street
London EC2A 2ES (GB)

(54) ADJUSTABLE SHIELDBOX FOR VEHICLE TRANSPONDER OR ONBOARD UNIT

(57) A holder is provided for the reception and selective shielding of an electronic vehicle identifying device used with automatic toll collection. The holder includes a shielding portion which is manually actuated by the vehicle operator when it is desired to permit communication between the signal of the vehicle identifying transponder and an externally located interrogator which ascertains the presence of the vehicle.

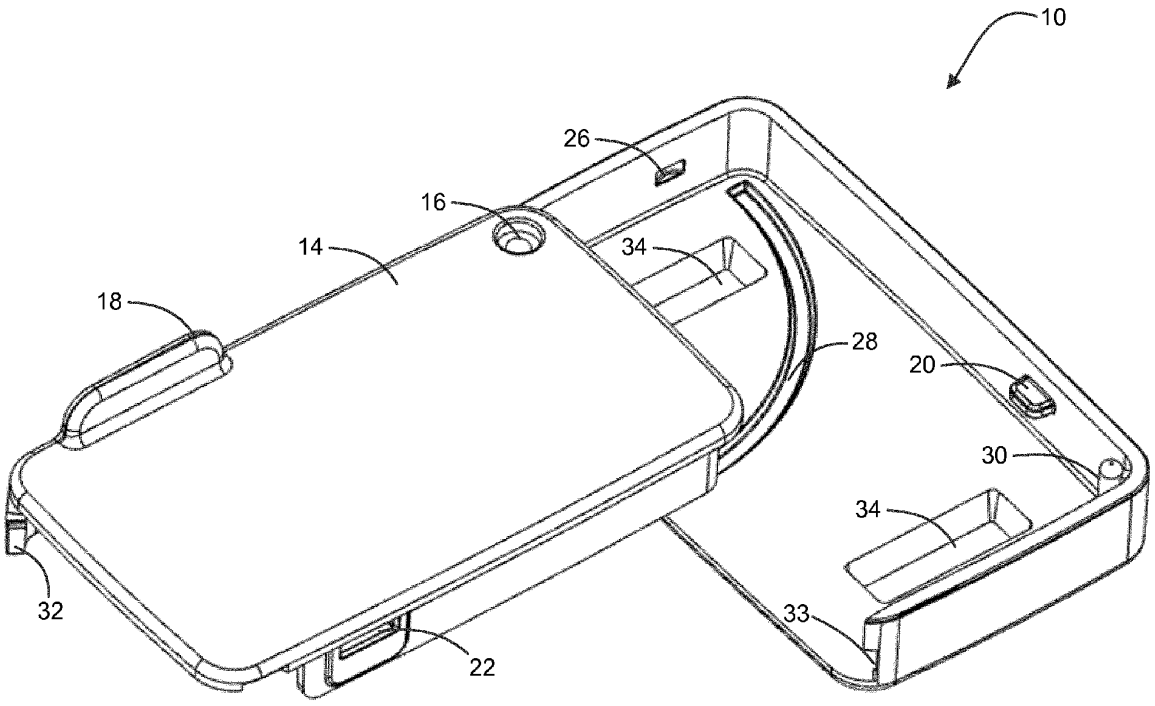

FIG. 1A

EP 3 716 226 A1

Description

Technical Field

[0001] The present disclosure relates to a transponder holder, and more specifically to a device that may selectively control the operation of a vehicle transponder or onboard unit.

Background

[0002] Electronic toll collection systems provide a way of managing traffic volume through toll collection points. Such systems typically include a reader at the toll station which interrogates a wireless payment device located on a vehicle. The payment device may be a wireless onboard unit or a transponder, such as an RFID (radio frequency identification device). The transponder is typically mounted on the windshield of the vehicle, and emits a signal that identifies that particular vehicle, user, or account. For example, upon interrogation by a reader, the transponder emits a radio frequency (RF) signal that includes information corresponding to an account code unique to the transponder. Therefore, the user can be properly charged for going through the toll.

[0003] However, because of the continued presence of the transponder in an activated mode within the vehicle, there may be situations when the vehicle operator prefers not to emit the signal. At times it may be desirable for a driver of a vehicle to pay for the toll directly and not rely upon the payment device in the vehicle. For example, if the driver has rented the car from a rental company, the driver may prefer to pay the toll themselves as opposed to relying on the transponder provided with the rental car. Furthermore, at times it may be desirable for the driver to selectively "turn off" the transponder in instances where the driver is not required to pay a toll (for example, in "high occupancy vehicle" situations) and removal of the transponder from the windshield is not feasible or practical. Compounding the issue is that transponders may include peel-and-stick credit form factors, whereby removal from the windshield may damage the transponder and effectively destroy its transmission capabilities. Furthermore, at times a driver may want to transfer a transponder to another vehicle, which is difficult, if not impossible, when the transponder is of the peel-and-stick variety.

[0004] Accordingly, it would be preferable to limit the activation of the transponder to those situations in which the vehicle operator is passing is through the toll station or within a restricted lane and desires to utilize the transponder for the automatic toll collection.

Brief Description of the Drawings

[0005]

FIG. 1A is a first top perspective view of a shieldbox in an open configuration according to one embodiment.

FIG. 1B is a second top perspective view of the shieldbox shown in FIG. 1A.

FIG. 1C is a bottom perspective view of the shieldbox shown in FIG. 1A.

FIG. 1D is a front view of the shieldbox shown in FIG. 1A.

FIG. 1E is a bottom view of the shieldbox shown in FIG. 1A.

FIG. 1F is a top view of the shieldbox shown in FIG. 1A.

FIG.2A is a bottom perspective view of a shieldbox in an open configuration holding a transponder according to one embodiment.

FIG. 2B is a front view of the shieldbox shown in FIG. 2A.

FIG. 2C is a bottom view of the shieldbox shown in FIG. 2A.

FIG. 2D is a left side view of the shieldbox shown in FIG. 2A.

FIG. 2E is a right side view of the shieldbox shown in FIG. 2A.

FIG. 2F is a rear view of the shieldbox shown in FIG. 2A.

FIG. 3A is a top perspective view of a shieldbox in a closed configuration according to one embodiment.

FIG. 3B is a bottom perspective view of the shieldbox shown in FIG. 3A.

FIG. 3C is a front view of the shieldbox shown in FIG. 3A.

FIG. 3D is a top view of the shieldbox shown in FIG. 3A.

FIG. 3E is a bottom view of the shieldbox shown in FIG. 3A.

FIG. 3F is a left side view of the shieldbox shown in FIG. 3A.

FIG. 3G is a right side view of the shieldbox shown in FIG. 3A.

FIG. 3H is a rear view of the shieldbox shown in FIG. 3A.

Detailed Description of Preferred Embodiments

[0006] FIGS. 1A-1F illustrate a shieldbox 10 or receptacle in an open configuration according to one embodiment. FIGS. 2A-2F illustrate the shieldbox 10 in the open configuration holding a transponder 42 or receptacle according to one embodiment. FIGS. 3A-3H illustrate the shieldbox 10 or receptacle in a closed configuration according to one embodiment. The shieldbox 10 may also be referred to herein as a transponder holder or simply as a holder. A user, such as a vehicle operator, may selectively change the shieldbox 10 from the open configuration to the closed configuration, and from the closed configuration to the open configuration, to control the operation of a transponder 42. For example, the shieldbox 10 may be in a closed configuration to provide a user

with the ability to opt out of tolling using the transponder or in an open configuration to opt into tolling using the transponder. Descriptions of the various components may apply to any of the embodiments.

[0007] FIGS. 1A-1F illustrate various views of a shieldbox 10 in an open configuration according to one embodiment. The shieldbox 10 includes a housing 12 and a lid 14. In certain embodiments, the housing 12 and/or the lid 14 comprises a molded plastic material. In addition, or in other embodiments, the housing 12 and/or the lid 14 includes an electromagnetic (EM) shielding material. The EM shielding materials may include carbon filaments. The carbon filaments may be formed into a matrix. In some embodiments, the carbon filaments may be combined with other resins to form the shieldbox 10 using plastic injection molding.

[0008] The lid 14 may include a planar wall coupled to a first perimeter wall, a second perimeter wall, and a third perimeter wall. The planar wall may cover a transponder along a first planar side and the perimeter walls may cover a transponder along three edges. In some embodiments, the planar wall extends along the first planar side of the transponder to beyond a fourth edge of the transponder that is left uncovered when the lid is opened.

[0009] The lid 14 is attached to the housing 12 at a pivot point or hinge 16. In the disclosed embodiment, the hinge 16 is located at or near a corner of the shieldbox 10. A user may rotate the lid 14 about the hinge 16 to change from the open configuration to the closed configuration, and vice-versa.

[0010] As shown, the lid 14 may include a handle 18 that the user may hold to open and close the lid 14. In some embodiments, the handle 18 and the lid 14 may be a single molded piece. In some embodiments, the handle 18 may be coupled to the lid 14.

[0011] Certain embodiments include one or more sets of tabs and slots that interface with one another when the lid 14 is closed. The tabs and slots may provide correct alignment of the lid 14 with the housing 12 in the closed configuration and/or may provide a friction fit to assist in holding the lid 14 closed. For example, a wall of the housing 12 may include a first tab 20 configured to fit within a first slot 22 in a wall of the lid 14 when the lid 14 is closed. In addition, or in other embodiments, a wall of the lid 14 may include a second tab 24 configured to fit in a second slot 26 in a wall of the housing 12 when the lid 14 is closed. Certain embodiments may also include mating slot/tab combinations 32, 33 at respective corners that align when the lid 14 is closed.

[0012] The housing 12 may include an arched groove or guide 28 on an interior surface configured to interface with a guide post (not shown) on the lid 14 to assist with stability and proper motion as the lid 14 is opened and closed. The post may be integrated into a perimeter wall of the lid 14.

[0013] In certain embodiments, the housing 12 includes a post 30 configured to assist with holding the lid 14 closed. The post 30 may include a rounded top that extends above the walls of the housing so as to enter into a notch 31 in the lid 14. The notch 31 may include a domed portion that engages the rounded top of the post 30 to hold the lid 14 closed. In certain embodiments, the rounded top of the post 30 and/or the domed portion of the notch 31 comprises a magnetic material to provide added security to hold the lid 14 in the closed position. The post 30 may cause the lid 14 to flex when transitioning between an open configuration and a closed configuration. For example, in some embodiments, the lid 14 deflects to allow the post to move out of the notch 31. The lid 14 may provide a compression fit between the post 30 and the notch 31. In some embodiments post 30 may be located at or near a corner of the shieldbox 10 opposite the corner of the location of the hinge 16.

[0014] One or more legs 34 may extend from the bottom of the housing 12 to provide a desired separation or distance D between the inside of a vehicle windshield and the transponder or transducer. See, e.g., the distance D shown in FIG. 2B. In one example embodiment, the distance D is about 20 millimeters (mm). However, skilled persons will recognize that other distances may be used for different types of transponders or configurations (including different vehicle windshield configurations). Although two legs 34 are shown, a single leg or additional legs could also be used. Although the figures show indentation in the inside of the housing 12 corresponding to the legs 34, in other embodiments the inside surface of the housing 12 is flat over the legs 34 and does include the indentations.

[0015] In certain embodiments, the ends of the legs 34 each include a pad 36. The pads 36 may comprise, for example, a pre-mounted adhesive, such as a peel-and-stick foam tape, to attach the shieldbox 10 to the inside of the windshield or other part of the vehicle. Other means of fastening the shieldbox 10 to the vehicle may also be used, such as suction cups or hook-and-loop fasteners.

[0016] The lid 14 may include a first stop 37 and the housing 12 may include a corresponding second stop 38 that interface with one another (e.g., abut against one another) in the open configuration to keep the lid 14 from rotating more than about 90 degrees from the closed position to the open position. The lid 14 may be secured to a vehicle window in an orientation that cause gravity to keep the lid in an open position.

[0017] As shown in FIGS. 1C, 1D, and 1E, certain embodiments include a transponder retainer 40 attached to or formed on an inside wall of the lid. The retainer 40 is configured to securely hold the transponder 42 to the rotatable lid 14 such that the transponder 42 does not inadvertently fall from the shieldbox in the open configuration or when transforming to or from the open configuration. In certain embodiments, the retainer 40 is configured to be inserted into or onto the transponder 42 and may, for example, snap into place. The retainer 40 may be configured to be selectively coupled to and removed from transponder 42. For example, the user may press a flexible tab on retainer 40 to remove the transponder

42. The retainer 40 may be configured for or keyed to a particular type of transponder. In other embodiments, other means may be used to permanently or temporarily secure the transponder 42 to the rotatable lid 14, such as adhesive, hook-and-loop fasteners, or other fasteners.

[0018] FIGS. 2A-2F illustrate the shieldbox 10 in the open configuration holding a transponder 42 according to one embodiment. A user, such as a vehicle operator, may selectively change the shieldbox from the open configuration to the closed configuration, and from the closed configuration to the open configuration, to control the operation of the transponder 42. In the open configuration, the transponder 42 may be operable to communicate wirelessly with an external device, such as a transponder reader at an automatic toll collection booth or along an HOV lane. In the closed configuration, the transponder 42 may be unable to communicate with the external device. In certain embodiments, the transponder 42 is completely enclosed (i.e., on all sides) within the shieldbox 10 in the closed configuration. The transponder 42 may provide on-way or two-way short-range to medium-range wireless communication with the external device. By way of example, the transponder 42 may use dedicated short-range communications (DSCR) to communicate with the external device. The lid 14 holds a proximal surface of the transponder 42 at a distance of 20 millimeters from the vehicle windshield. As referred to herein, the proximal surface of the transponder 42 is the planar surface of the transponder 42 that is closest to the lid 14, and the distal surface of the transponder 42 is the planar surface of the transponder 42 that is closest to a vehicle windshield.

[0019] The lid 14 may be rotated relative to the housing 12 to transition between an open configuration and a closed configuration. When the housing 12 and the lid 14 are in the closed configuration, the housing 12 and the lid 14 enclose the transponder 42 preventing the wireless communication signals from the transponder 42 from being sent to an external device. When the housing 12 and the lid 14 are in the open configuration a space between the transponder 42 and the vehicle windshield is substantially unobstructed by the housing.

[0020] While in a closed position, the lid 14 and the housing 12 may completely enclose the transponder 42, in the open position the lid 14 and the windshield may substantially enclose the transponder 42. That is, a planar wall of the lid 14 may cover a first side of the transponder 42 while three edges of the transponder 42 may be covered by perimeter walls of the lid 14. Additionally, the vehicle windshield may be near a second side of the transponder 42, leaving only small gaps between the perimeter walls of the lid 14 and the vehicle windshield. In some embodiments, one edge of the transponder 42 may be left uncovered. In some embodiments, the planar wall extends along the first planar side of the transponder 42 to beyond an uncovered edge (uncovered while in an open conjugation) of the transponder 42.

[0021] The length of the planar wall extending beyond the uncovered edge of the transponder 42 is sized to limit access to the transponder. This may prevent theft of the transponder. For example, a person's hand may be too large to reach the transponder 42 across the length of the planar wall extension when attached to a vehicle windshield. However, the open edge may provide access to individuals with authorized tools to remove the transponder 42 without removing the shieldbox 10 form the vehicle windshield.

[0022] Further, because the transponder 42 is still substantially enclosed when in an open position, tampering or stealing the transponder 42 would be difficult without being detected. For example, a thief would likely need to remove the shieldbox 10 or damage the shieldbox 10 to access the transponder 42. Thus, a visual inspection of the condition of the shieldbox 10 would notify an operator of theft.

[0023] FIGS. 3A-3H illustrate the shieldbox 10 in a closed configuration according to one embodiment. In this embodiment, the lid 14 and the housing 12 completely enclose a transponder 42 in the closed configuration. Shielding materials in the lid 14 and the housing 12 may prevent wireless signals from the transponder 42 from penetrating the shieldbox 10. Thus, the shieldbox 10 may prevent the transponder 42 from communicating with an external device, such as a transponder reader at an automatic toll collection booth or along an HOV lane.

[0024] It will be understood to those having skill in the art that many changes may be made to the details of the above-described embodiments without departing from the underlying principles of the invention. The scope of the present invention should, therefore, be determined only by the following claims.

Claims

1. A receptacle for retaining and selectively shielding a transponder, the receptacle comprising:

a housing securable to a vehicle windshield, at least a portion of the housing comprising a shielding material; and

a lid rotatably coupled to the housing and securable to a transponder, at least a portion of the lid comprising the shielding material, the lid comprising a planar wall coupled to a first perimeter wall, a second perimeter wall, and a third perimeter wall to cover the transponder along a first planar side and three edges, wherein the planar wall extends along the first planar side of the transponder to beyond a fourth edge of the transponder;

wherein the lid may be rotated relative to the housing to transition the housing and lid between an open configuration and a closed configuration,

wherein when the housing and the lid are in the

closed configuration, the housing and the lid enclose the transponder, and
wherein when the housing and the lid are in the open configuration a space between the transponder and the vehicle windshield is substantially unobstructed by the housing.

2. The receptacle of claim 1, wherein when the housing and the lid are in the open configuration the transponder is substantially enclosed by the vehicle windshield, the planar wall of the lid, the first perimeter wall of the lid, the second perimeter wall of the lid, and the third perimeter wall of the lid.

3. The receptacle of claim 1 or claim 2, wherein a length of the planar wall extending beyond the fourth edge of the transponder is sized to limit access to the transponder.

4. The receptacle of any one of claims 1-3, wherein the housing further comprises an arched groove on an interior surface of the housing, and wherein the lid further comprises a guide post to interface with the arched groove to assist with stability and proper motion of the lid when transitioning between the open configuration and the closed configuration.

5. The receptacle of any one of claims 1-4, wherein the housing and the lid further comprise one or more sets of tabs and slots that interface with one another when the housing and the lid are in the closed configuration.

6. The receptacle of claim 5, wherein a first wall of the housing includes a first tab configured to fit within a first slot in the first perimeter wall of the lid, and wherein the second perimeter wall of the lid includes a second slot configured to fit within a first slot in a second wall of the housing.

7. The receptacle of any one of claims 1-6, wherein the housing further comprises a post with a rounded top that extends above walls of the housing, and wherein the lid comprises a notch configured to engage the rounded top of the post to hold the lid in place when the housing and the lid are in the closed configuration.

8. The receptacle of claim 7, wherein the rounded top of the post causes the lid to flex when transitioning between the open configuration and the closed configuration.

9. The receptacle of claim 7 or claim 8, further comprising a hinge coupling the housing and the lid, the hinge in a first corner of the housing and the post in a second corner of the housing, wherein the first corner and the second corner are opposite corners.

10. The receptacle of any one of claims 1-9, wherein the lid holds a proximal surface of the transponder at a distance of 20 millimeters from the vehicle windshield.

11. The receptacle of any one of claims 1-10, wherein the housing comprises one or more legs sized to provide a desired separation distance between the vehicle windshield and the transponder.

12. The receptacle of any one of claims 1-11, wherein the shielding material comprises a carbon filament.

13. The receptacle of any one of claims 1-12, wherein the lid further comprises a retainer to hold the transponder.

14. The receptacle of any one of claims 1-13, wherein the lid further comprises a first stop and the housing further comprises a second stop, wherein the first stop and the second stop interface with one another in the open configuration to keep the lid from rotating more than about 90 degrees from the closed configuration to the open configuration.

15. The receptacle of any one of claims 1-14, wherein the lid further comprises a handle.

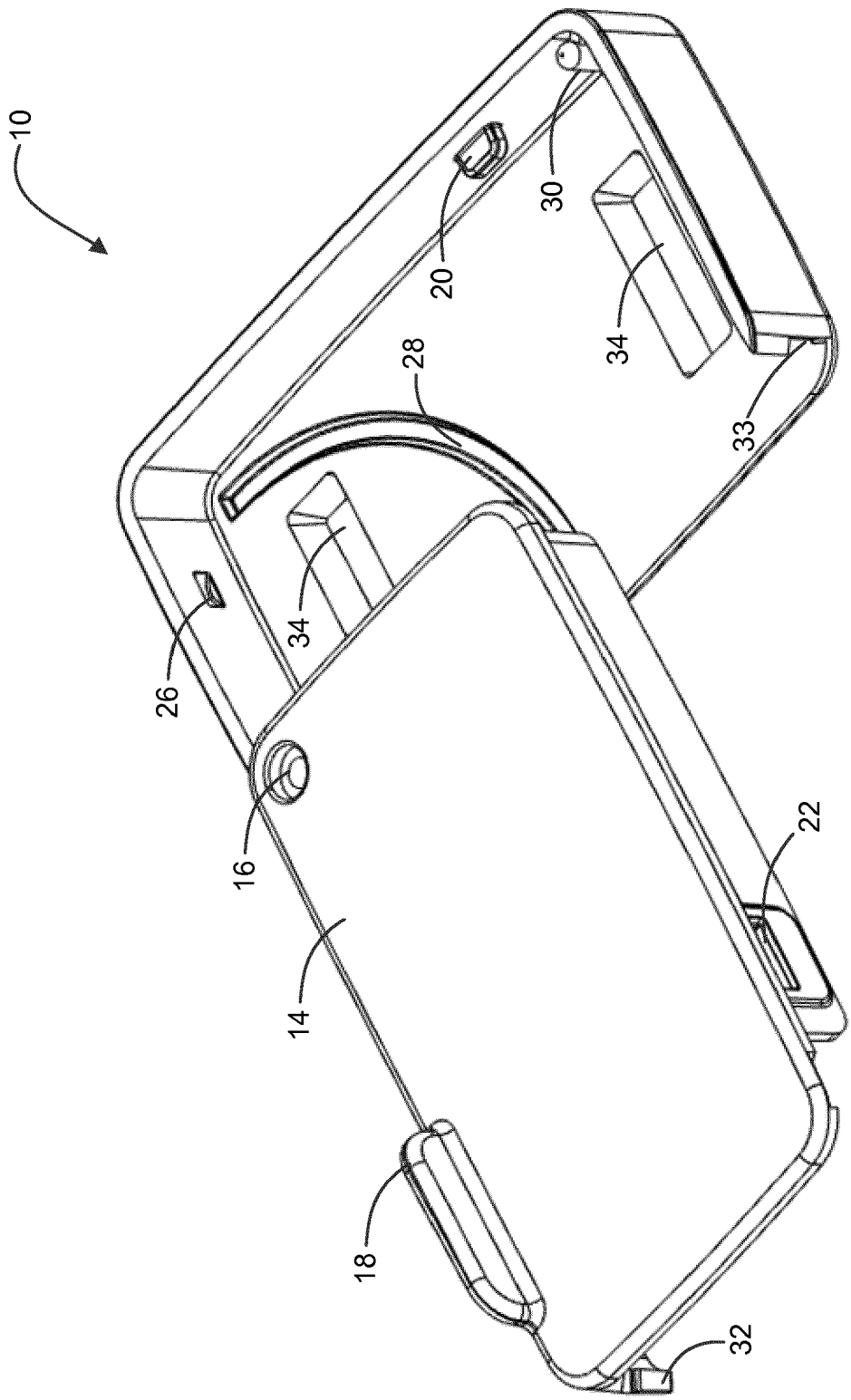

FIG. 1A

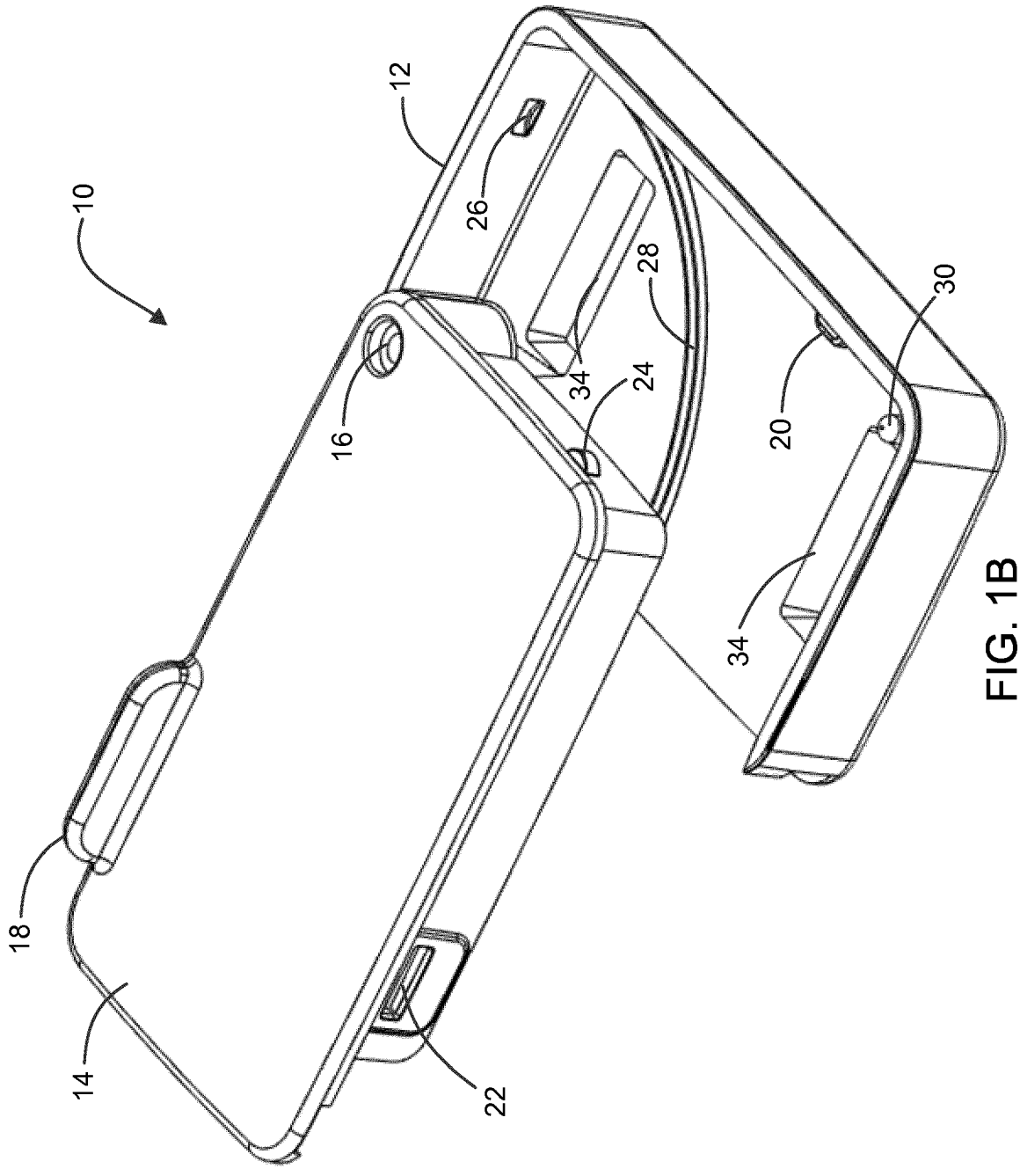

FIG. 1B

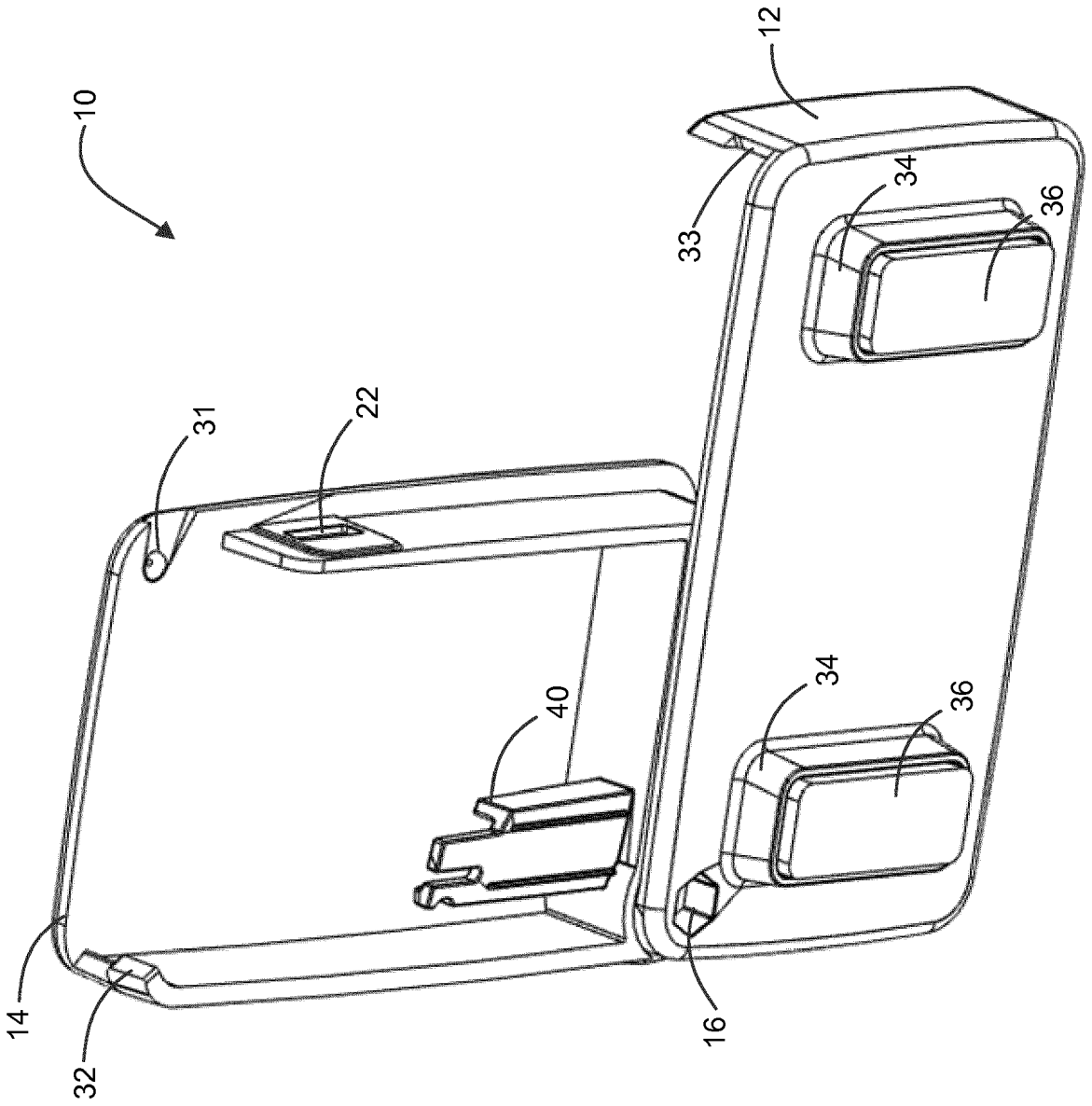

FIG. 1C

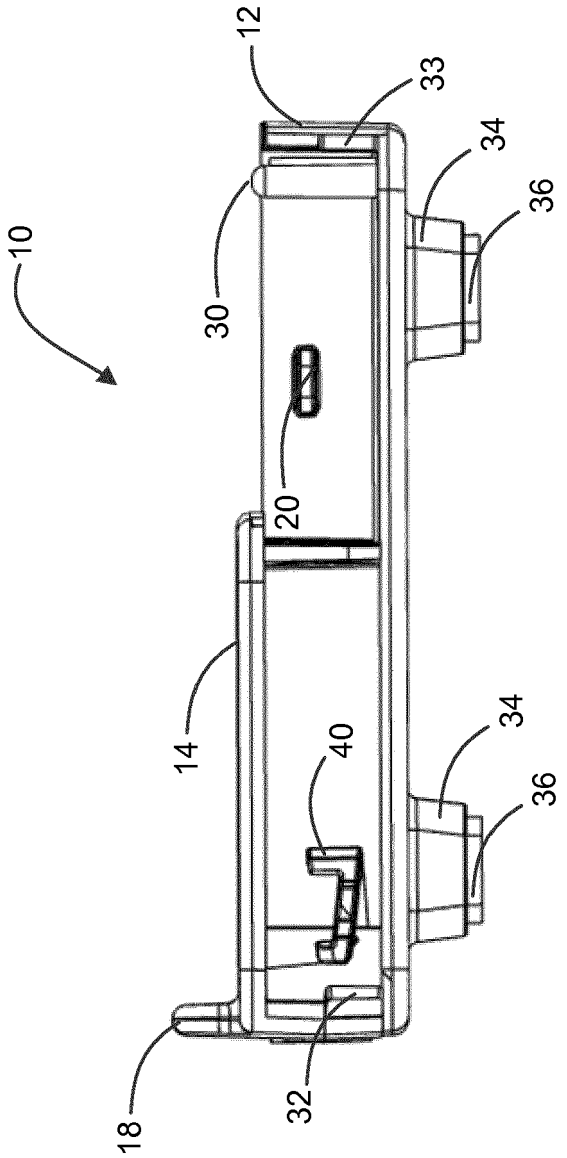

FIG. 1D

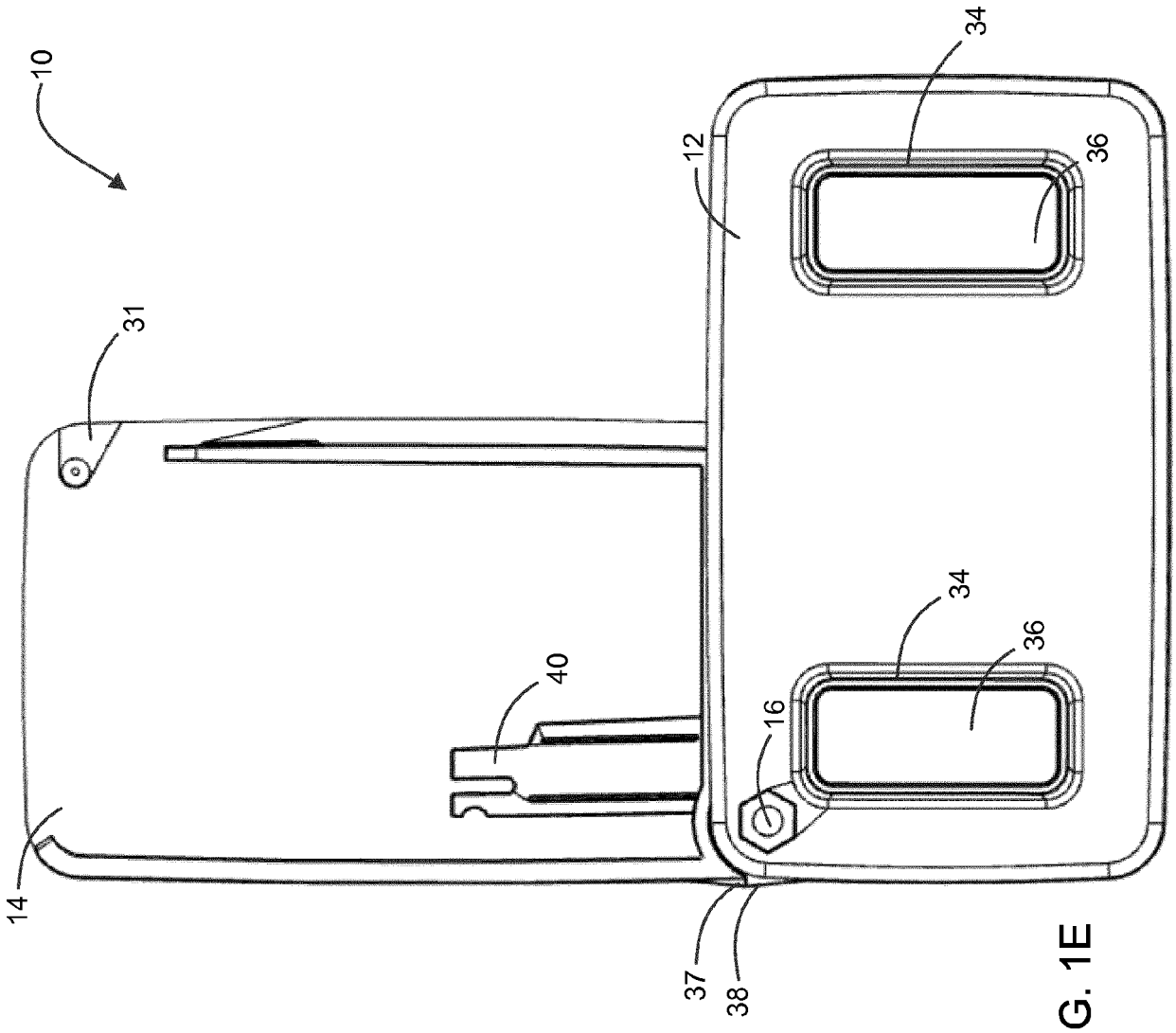

FIG. 1E

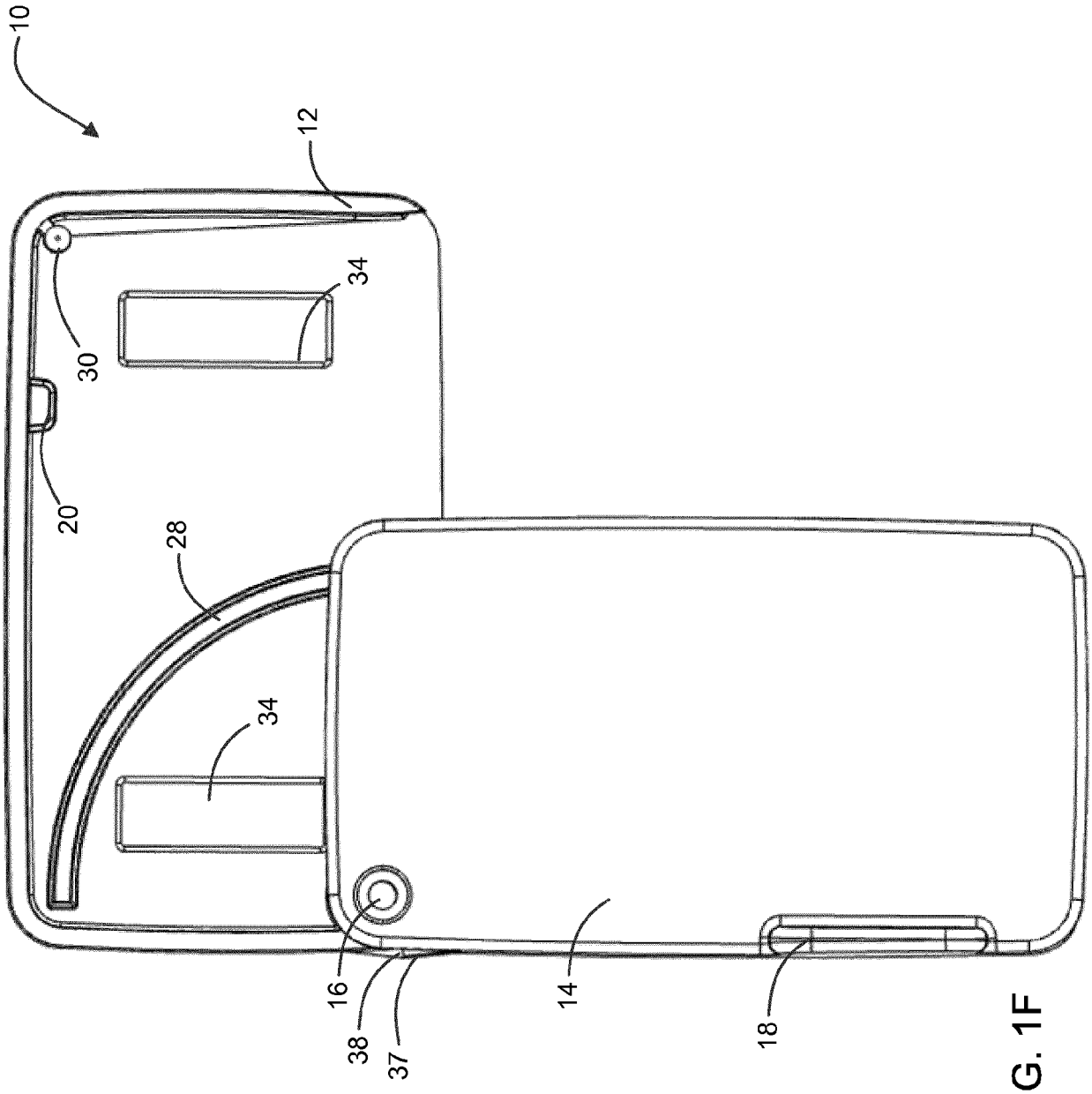

FIG. 1F

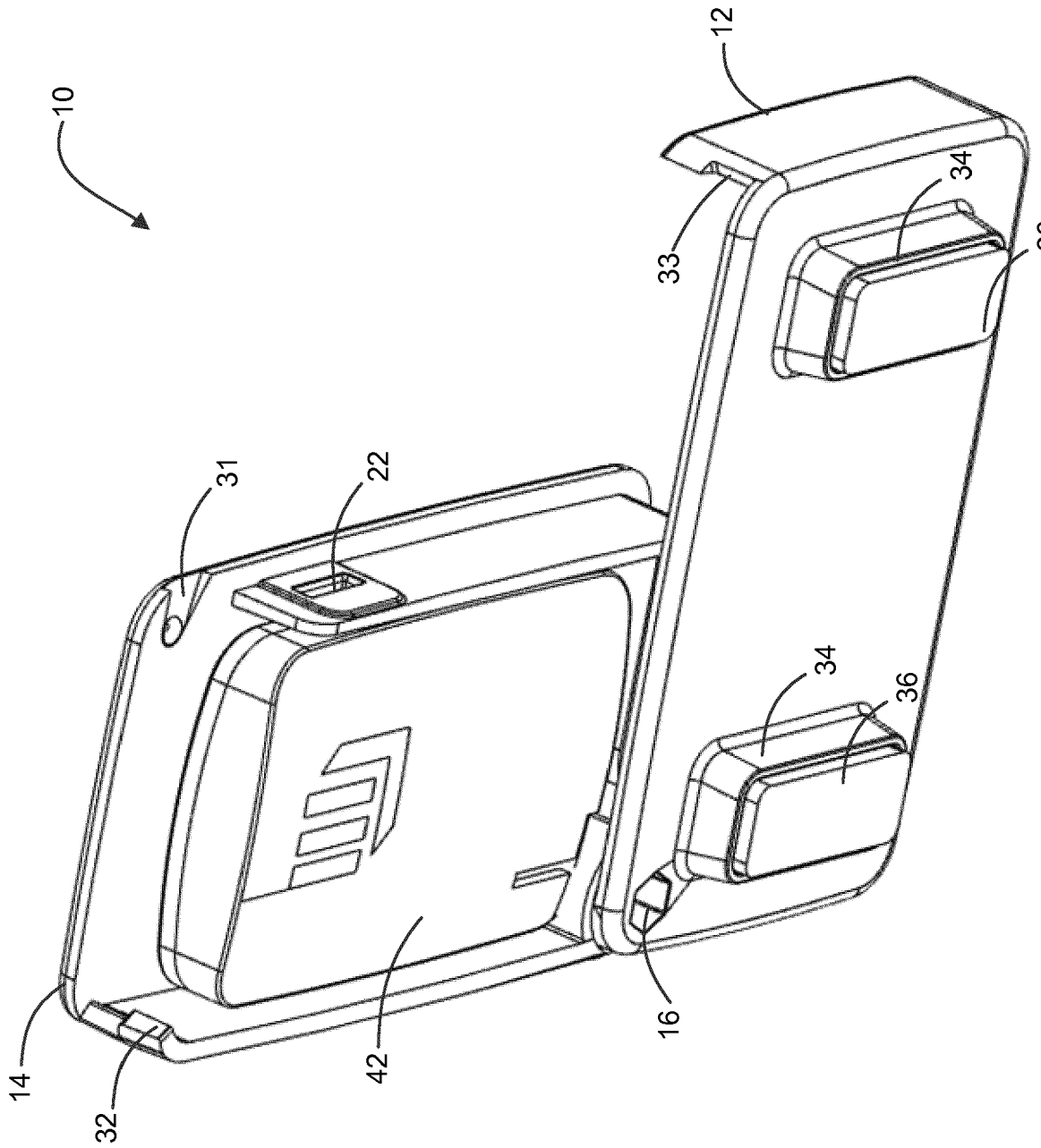

FIG. 2A

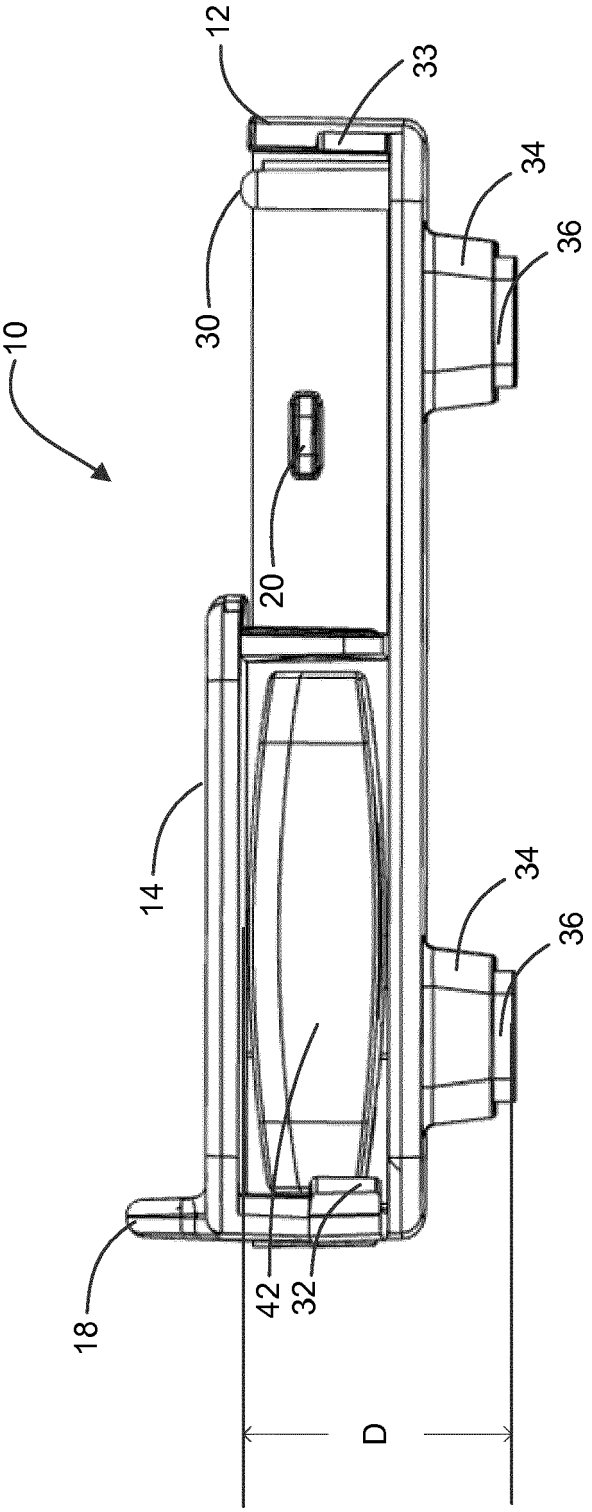

FIG. 2B

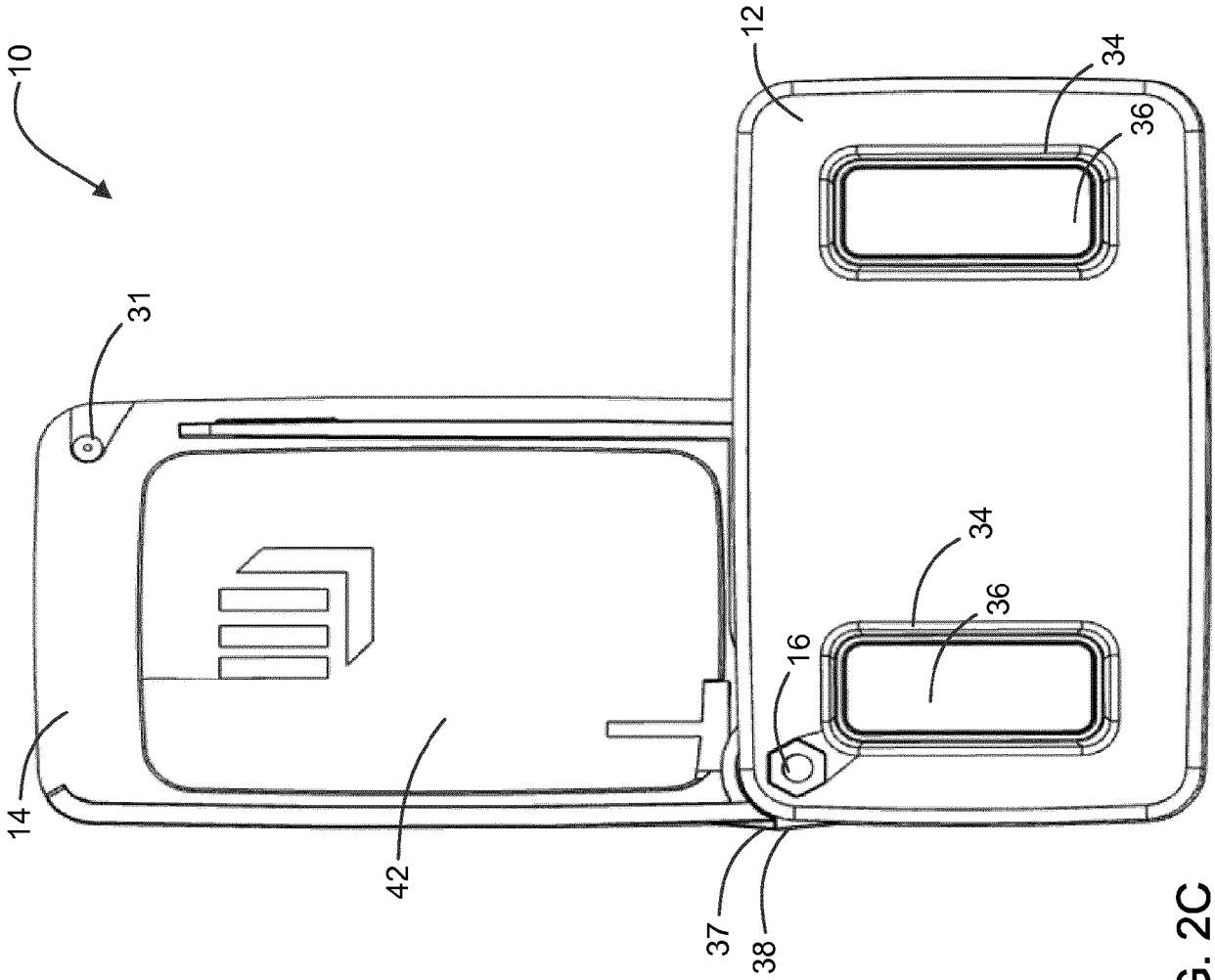

FIG. 2C

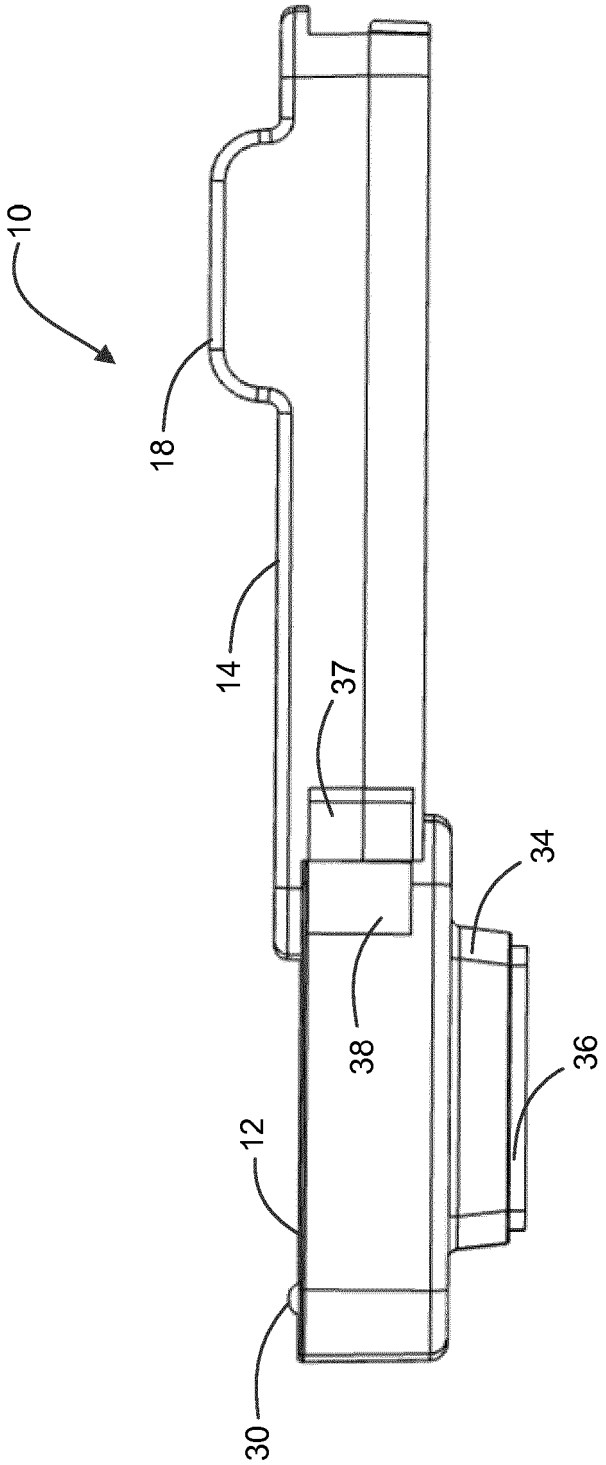

FIG. 2D

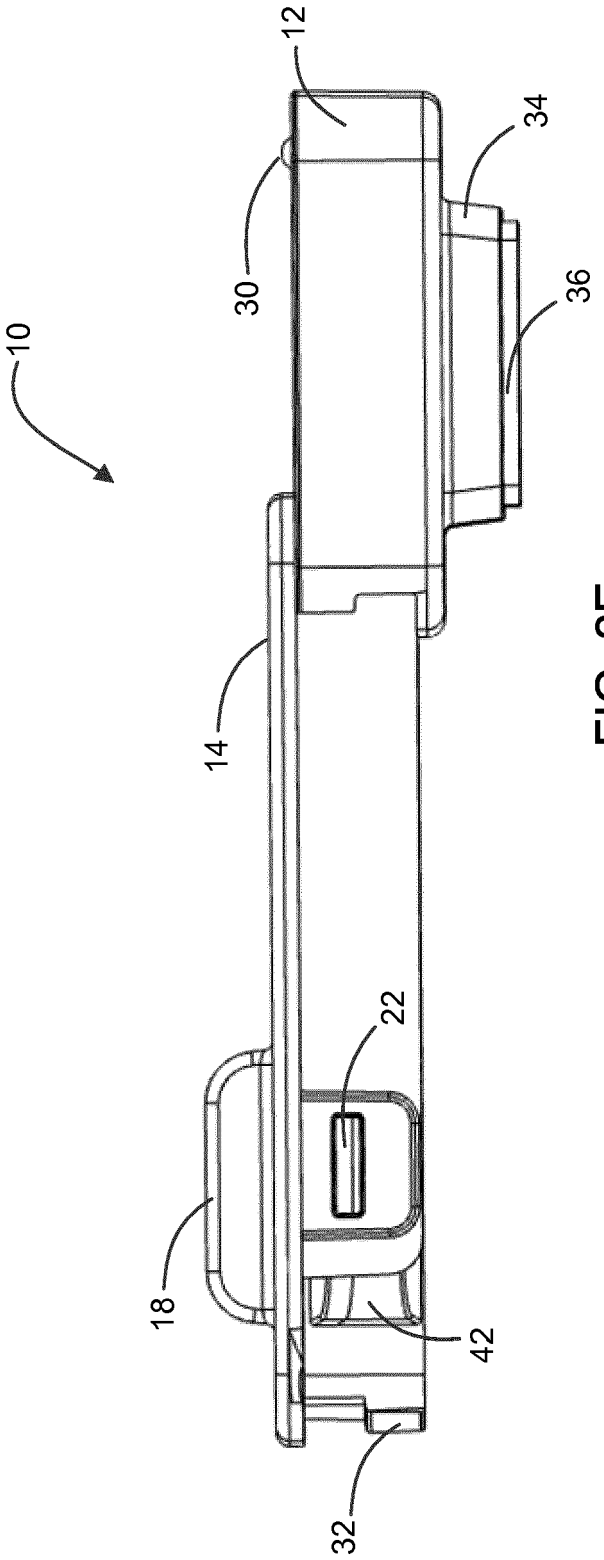

FIG. 2E

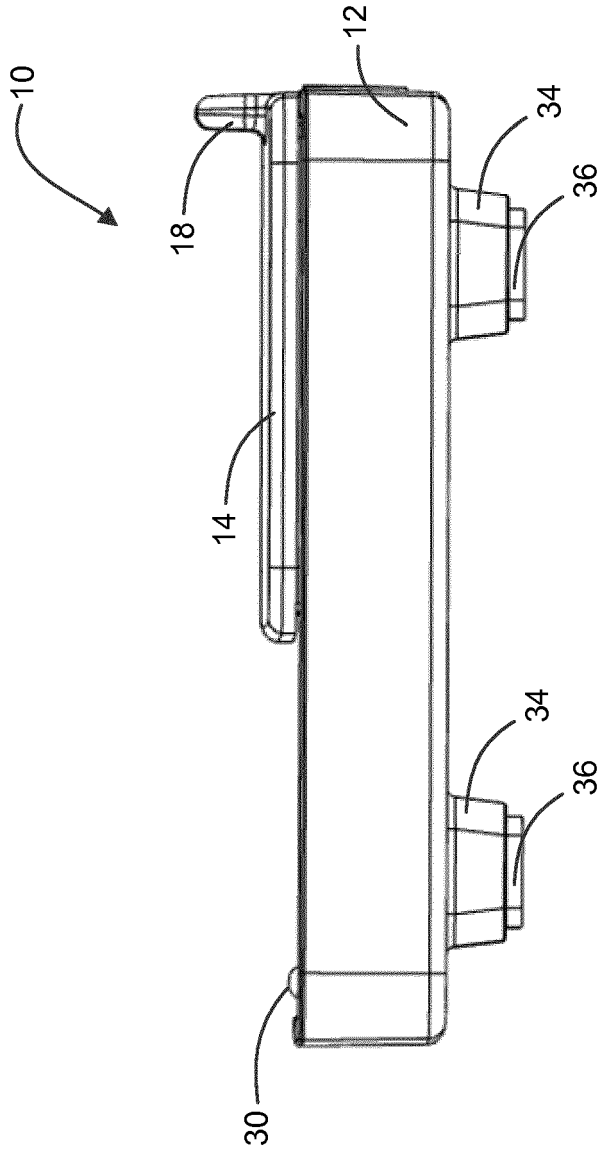

FIG. 2F

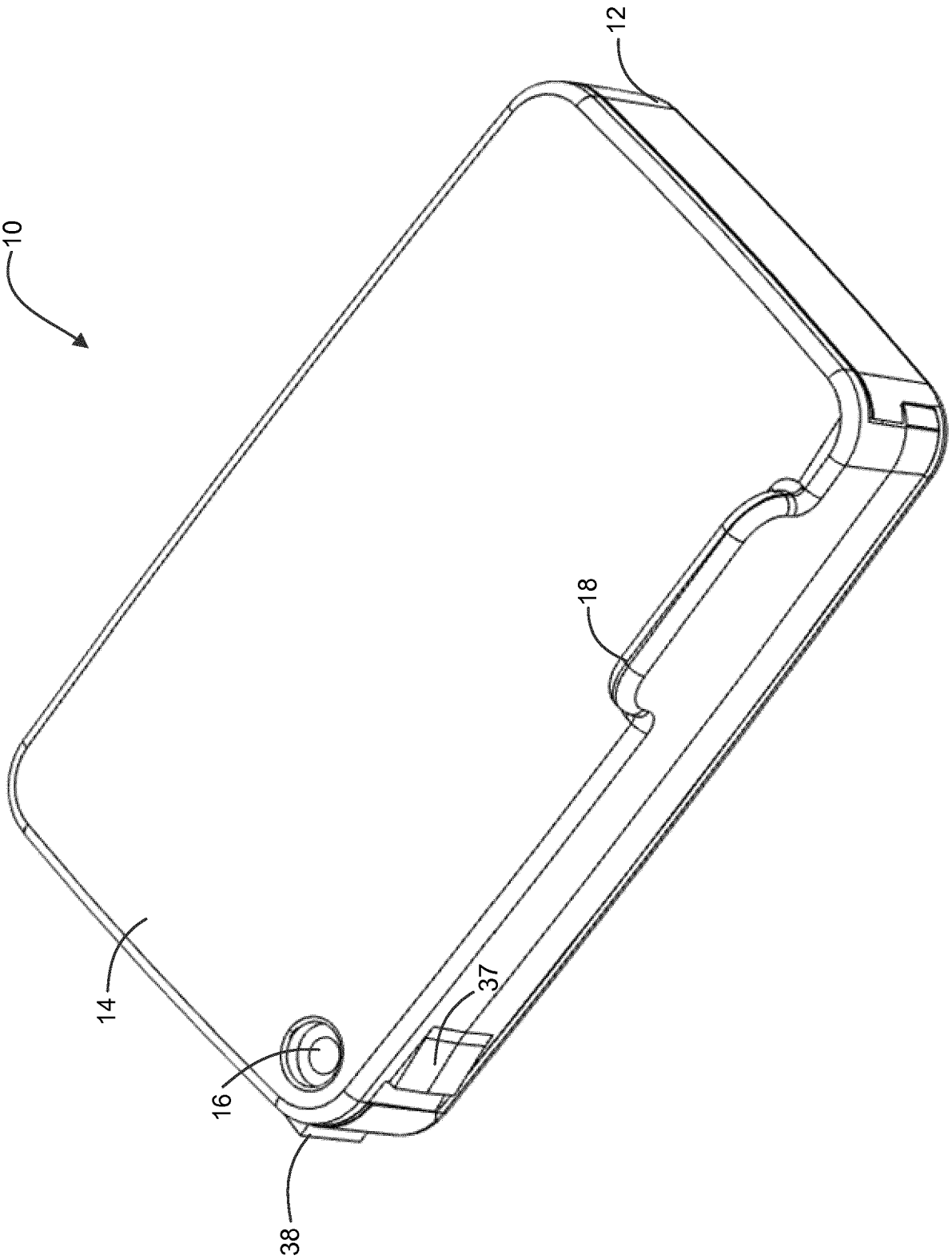

FIG. 3A

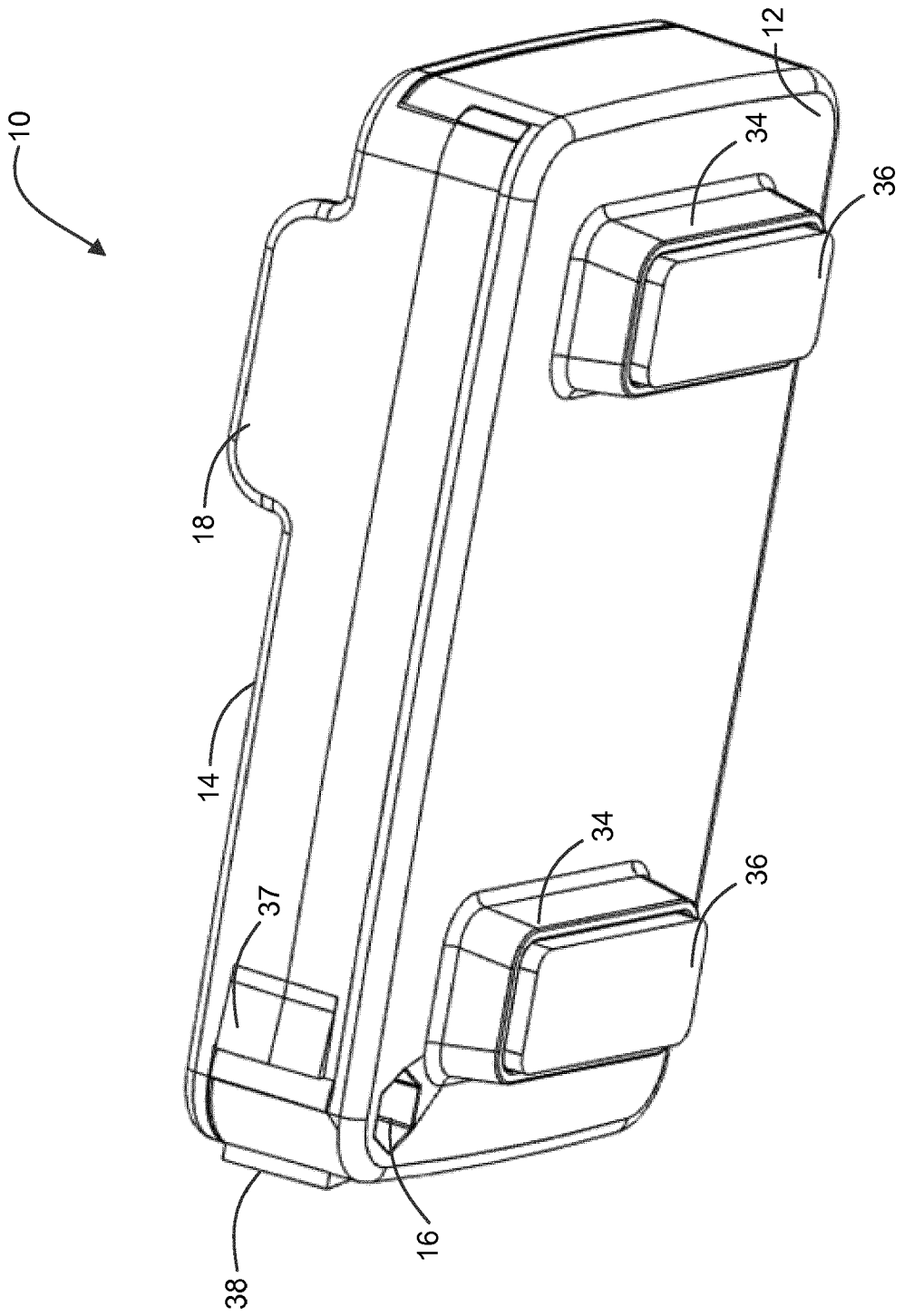

FIG. 3B

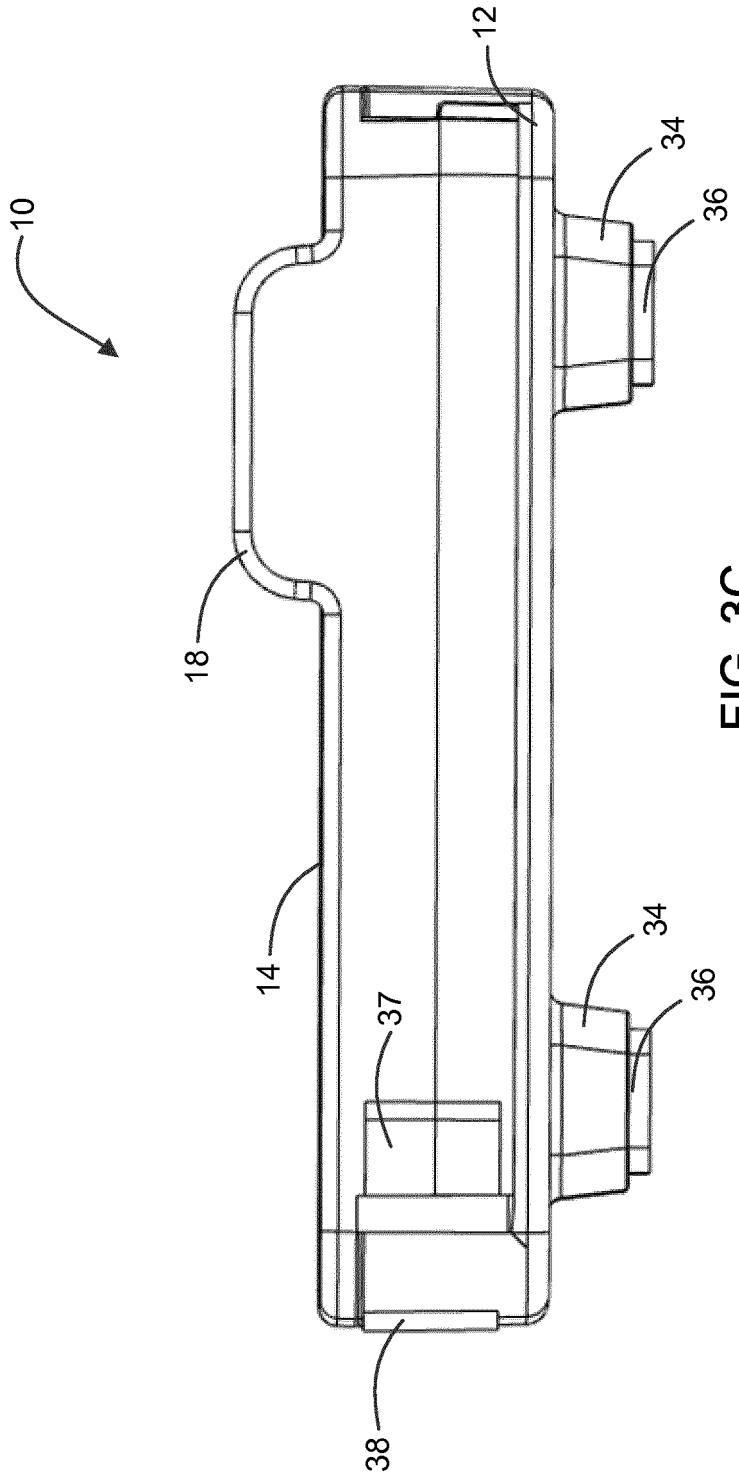

FIG. 3C

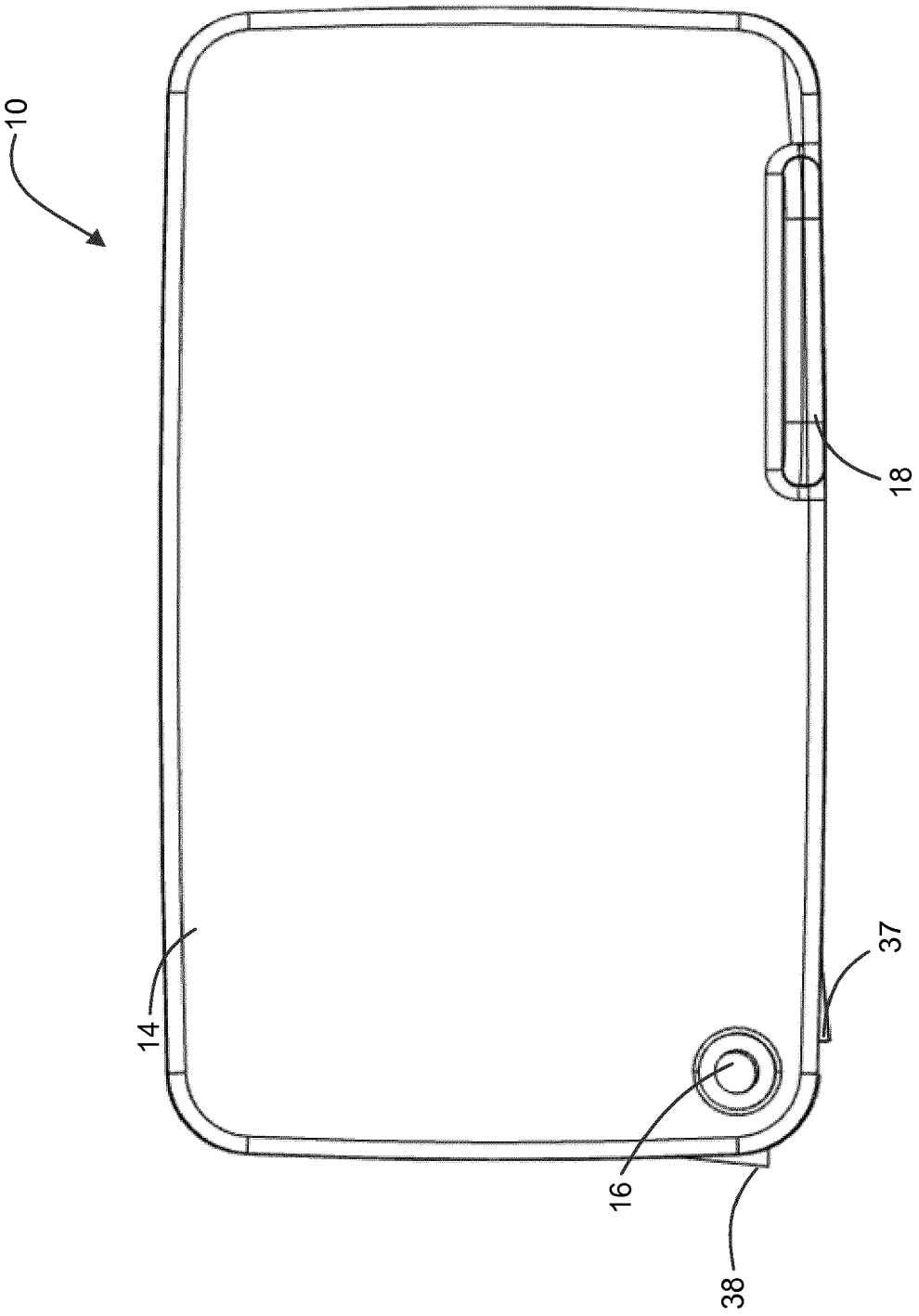

FIG. 3D

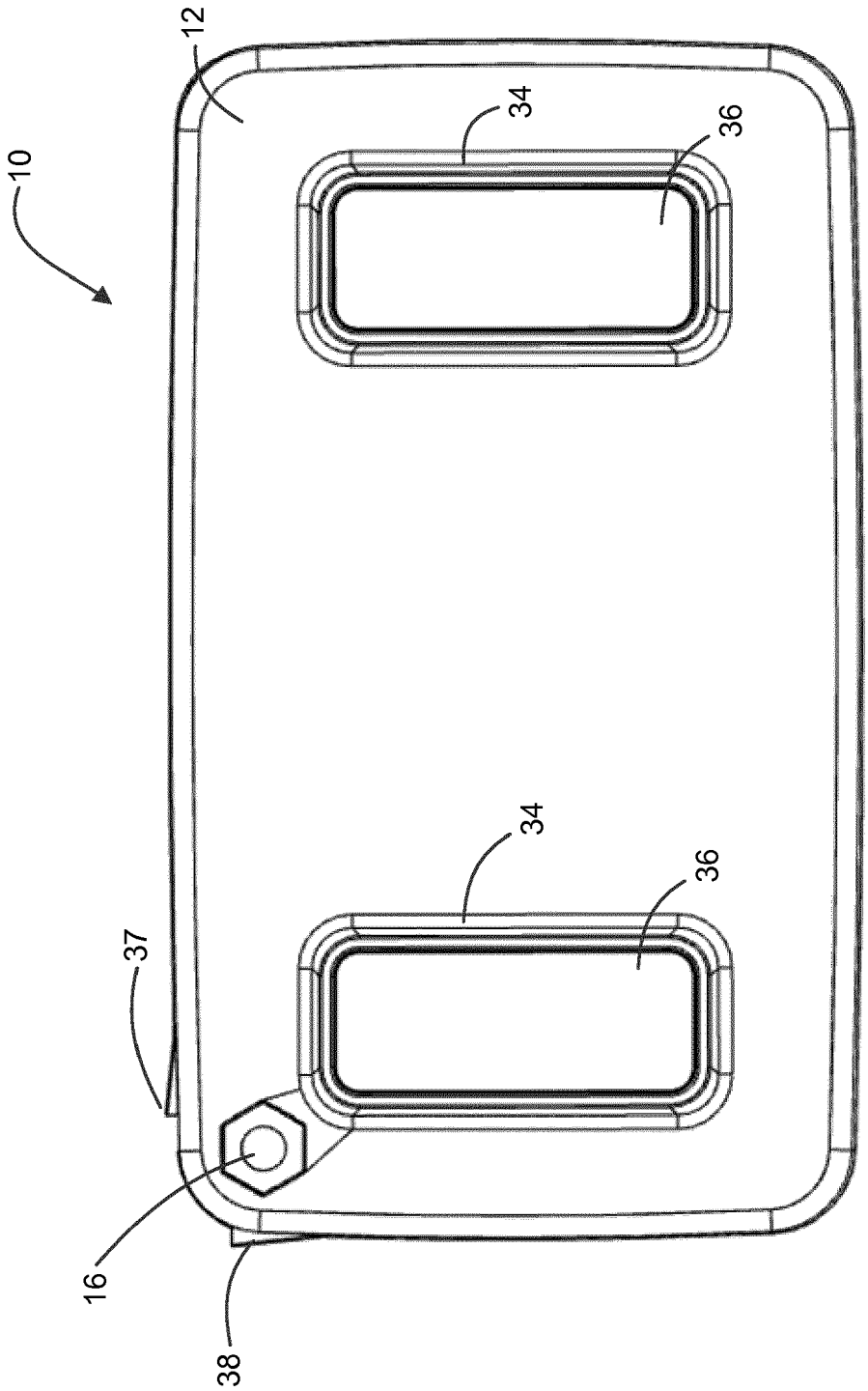

FIG. 3E

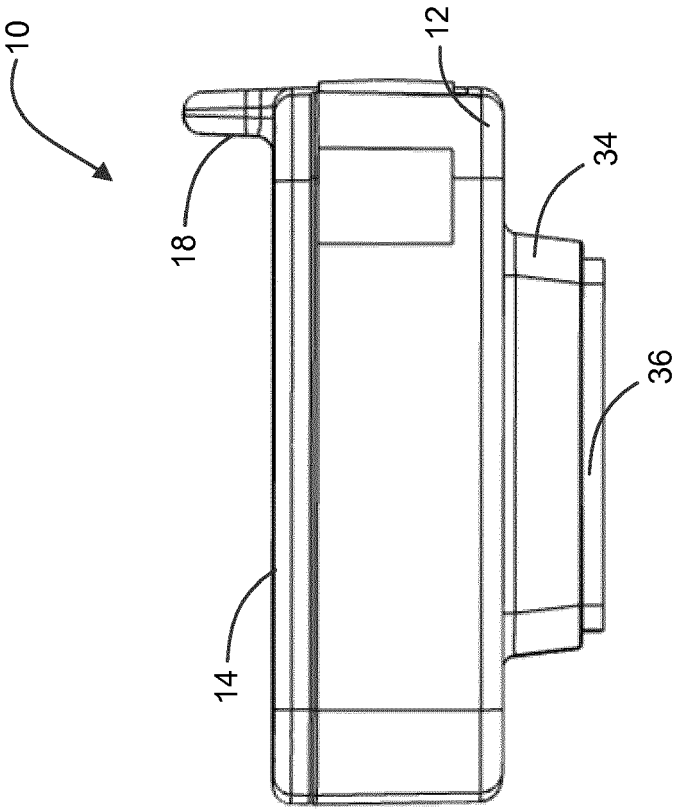

FIG. 3F

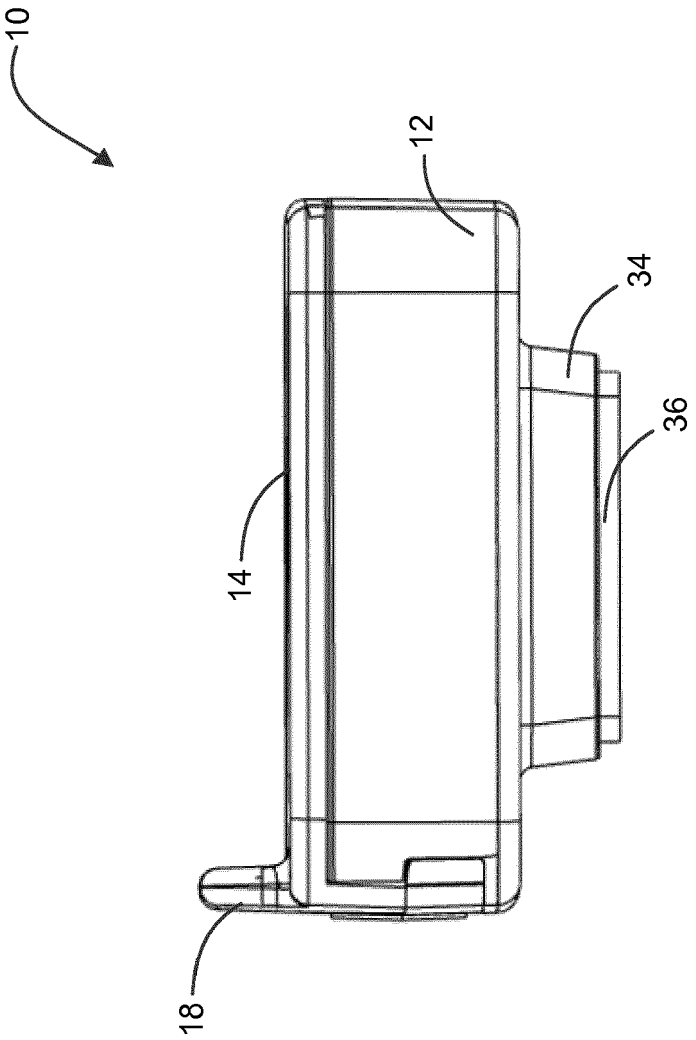

FIG. 3G

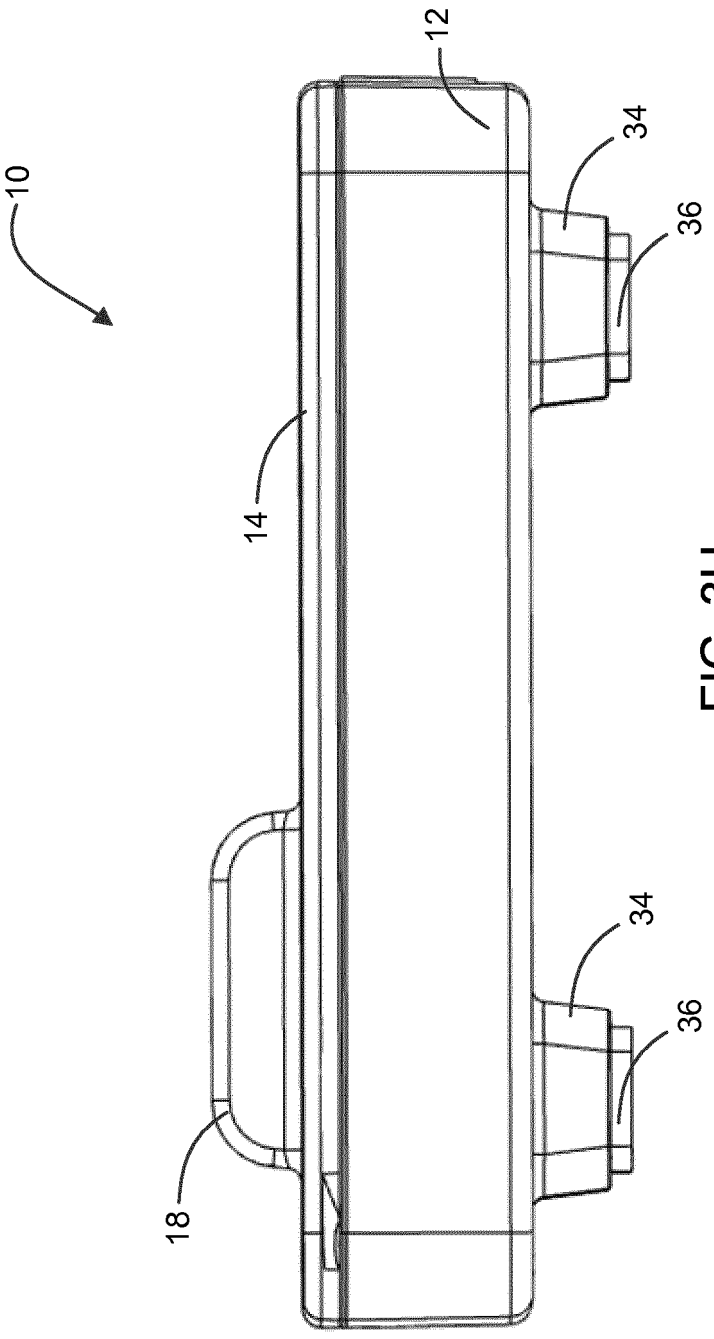

FIG. 3H

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 19 20 1757

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2009/248500 A1 (CENTNER DAVID [US] ET AL) 1 October 2009 (2009-10-01) * column 3, line 20 - column 8, line 19; figures 1-12 *	1-3,5-15	INV. G07C9/00 G07B15/06
A	US 6 127 938 A (FRIEDMAN SOLOMON [US]) 3 October 2000 (2000-10-03) * column 3, line 45 - column 5, line 6; figures 1-8 *	1-15	
A	US 2007/158378 A1 (RAFALOWITZ KAREN L [US] ET AL) 12 July 2007 (2007-07-12) * paragraph [0027]; figures 1-6 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			G07C G07B B60R G06K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 March 2020	Harder, Sebastian

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 20 1757

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-03-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009248500 A1	01-10-2009	US 2009248500 A1	01-10-2009
		US 2012081211 A1	05-04-2012
US 6127938 A	03-10-2000	AU 3745300 A	28-09-2000
		CA 2367453 A1	14-09-2000
		EP 1177540 A1	06-02-2002
		US 6127938 A	03-10-2000
		WO 0054238 A1	14-09-2000
US 2007158378 A1	12-07-2007	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82