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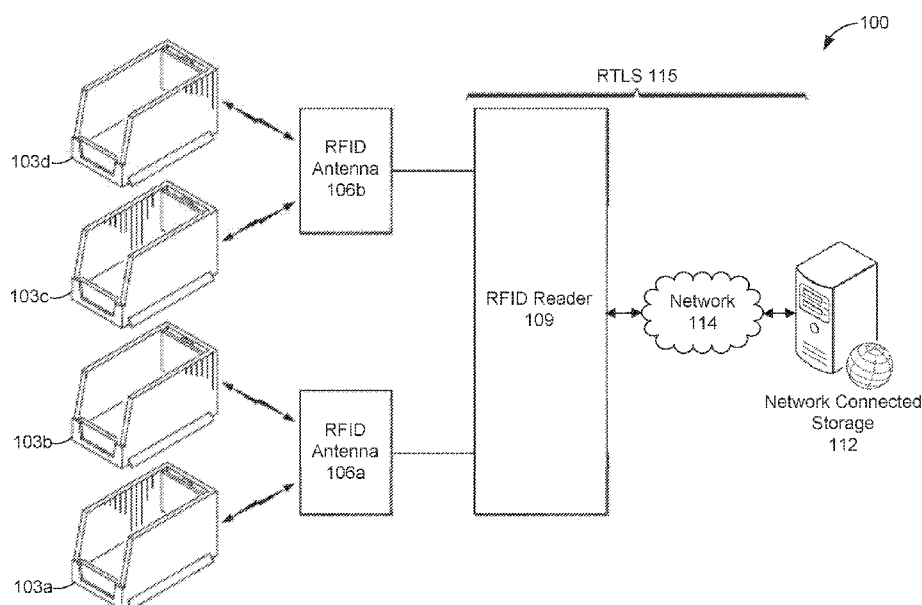


FIG. 1A

(57) Abstract: Disclosed are various embodiments for automated tracking of inventory levels in storage bins. In one embodiment, among others, an adjustable bin divider may comprise a supporting base that has a receiving slot at an end, the receiving slot comprising a slide channel that extends along a top portion of the supporting base; a radio frequency identification (RFID) tag that is attached to the supporting base; and a radio frequency (RF)-blocking slide divider that comprises a first panel with an RF shield and a second panel that has a narrowed end, the first panel being connected to the second panel at the narrowed end, the first panel being inserted in the receiving slot, the narrowed end fitting within the slide channel of the receiving slot, wherein the RF-blocking slide divider conceals the RFID tag from detection from an RFID reader at a position along the slide channel.



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- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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AUTOMATED INVENTORY CONTROL RFID BIN

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of, and priority to, co-pending U.S. Provisional Patent Application No. 62/332,648 entitled "AUTOMATED INVENTORY CONTROL RFID BIN" filed on May 6, 2016, which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] A storage bin is a container that can vary in size and shape. Oftentimes, a storage bin is used to hold multiple items. The storage bin can be configured to provide easy access to the items based on its size and shape. Multiple storage bins may also be placed on a storage rack. With multiple storage bins on a storage rack, different items can be placed in each storage bin. As a result, an individual can have easy access to various items.

SUMMARY

[0003] Embodiments of the present disclosure are related to a radio frequency identification (RFID)-enabled storage bin configured to transmit an indication of inventory levels of items in a storage bin to a remote computing device.

[0004] In one embodiment, among others, an adjustable bin divider is provided comprising a supporting base that has a receiving slot at an end, the receiving slot comprising a slide channel that extends along a portion of a top side of the supporting base; a radio frequency identification (RFID) tag that is attached to the supporting base; and a radio frequency (RF)-blocking slide divider that comprises a first panel with an RF shield and a second panel that has a narrowed end, the first

panel being connected to the second panel at the narrowed end, the first panel being inserted in the receiving slot, the narrowed end fitting within the slide channel of the receiving slot, wherein the RF-blocking slide divider conceals the RFID tag from detection from an RFID reader at a position along the slide channel.

[0005] In various embodiments, the position can comprise a first position. The adjustable bin divider can be positioned at an incline and the RF-blocking slide divider can move from the first position to a second position along the slide channel in response to gravity. In various embodiments, the adjustable bin divider can be positioned within a storage bin. In addition, the adjustable bin divider can further comprise a coiled spring that is attached to a back panel of the storage bin and the second panel of the RF-blocking slide divider.

[0006] In various embodiments, the position can comprise a first position, and the RF-blocking slide divider can move from the first position to a second position along the slide channel in response to the coiled spring pushing the second panel away from the back panel of the storage bin.

[0007] In various embodiments, the RF shield can be positioned substantially over the RF tag. In addition, the RF shield can comprise at least one of a metal foil, a metal sheet, a metal screen, a metal tape, or a metal foam. In various embodiments, the RF shield can comprise at least one of aluminum, copper, nickel, lead, or iron. In various embodiments, the second panel can be oriented in a plane different from the first panel.

[0008] In another embodiment, among others, an apparatus is provided comprising a storage bin; a radio frequency identification (RFID) tag that is attached to an interior portion of the storage bin; a supporting base that is positioned within the storage bin and has a receiving slot at an end, the receiving slot comprising a

slide channel that extends along a top portion of the supporting base; and a radio frequency (RF)-blocking slide divider that comprises a base panel and a divider panel that has a narrowed end, the base panel being connected to the divider panel at the narrowed end, the divider panel comprising an RF shield, the base panel being inserted in the receiving slot, the narrowed end fitting within the slide channel, wherein the RF-blocking slide divider conceals the RFID tag from detection from an RFID reader at a position along the slide channel.

[0009] In various embodiments, the supporting base can be positioned at an incline within the storage bin. In various embodiments, the position along the slide channel can be substantially near the end of the supporting base with the receiving slot. In addition, the position can comprise a first position, and the RF-blocking slide divider can move along the slide channel of the receiving slot from the first position to a second position, where the second position can be substantially near a distal end away from the receiving slot of the supporting base. In various embodiments, the apparatus can comprise a coiled spring that is attached to the divider panel and the interior portion of the storage bin. In addition, the RFID reader can be in data communication with a network connected storage device.

[0010] In another embodiment, among others, an apparatus is provided comprising a storage bin that includes an elevated platform. The elevated platform and a bottom portion of the storage bin can form a receiving slot, where the receiving slot comprises a slide channel that extends along a portion of the elevated platform; a radio frequency identification (RFID) tag that is attached to a portion of the storage bin; and a radio frequency (RF)-blocking slide divider that comprises a base panel connected to a divider panel that has a narrowed end. The base panel can be inserted in the receiving slot, and the narrowed end can fit within the slide channel.

The RF-blocking slide divider comprises an RF shield and conceals the RFID tag from detection from an RFID reader at a position along the slide channel.

[0011] In various embodiments, the RFID tag can be attached to a bottom portion of the storage bin or a back panel of the storage bin. In addition, the RF shield can be attached to a portion of the divider panel. In various embodiments, the RF shield can be attached to the base panel. In addition, the apparatus can comprise a coiled spring that is attached to an interior wall of the storage bin and the divider panel.

[0012] Other systems, methods, features, and advantages of the present disclosure will be or become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional systems, methods, features, and advantages be included within this description, be within the scope of the present disclosure, and be protected by the accompanying claims.

[0013] In addition, all optional and preferred features and modifications of the described embodiments are usable in all aspects of the disclosure taught herein. Furthermore, the individual features of the dependent claims, as well as all optional and preferred features and modifications of the described embodiments are combinable and interchangeable with one another.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Many aspects of the present disclosure can be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale, with emphasis instead being placed upon clearly illustrating the principles of the disclosure. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

[0015] FIG. 1A illustrates a networked environment according to various embodiments of the present disclosure.

[0016] FIG. 1B illustrates a perspective view of an example storage bin rack according to various embodiments of the present disclosure.

[0017] FIGS. 2A and 2B illustrate perspective views of an example supporting base of a radio frequency identification (RFID)-enabled storage bin according to various embodiments of the present disclosure.

[0018] FIG. 3 illustrates a cross sectional view of an example radio frequency (RF)-blocking slide divider of the RFID-enabled storage bin according to various embodiments of the present disclosure.

[0019] FIG. 4A illustrates a perspective view of the RF-blocking slide divider from FIG. 3 inserted in the supporting base from FIGS. 2A and 2B according to various embodiments of the present disclosure.

[0020] FIG. 4B illustrates a cross sectional view of the RF-blocking slide divider from FIG. 3 inserted in the supporting base from FIGS. 2A and 2B according to various embodiments of the present disclosure.

[0021] FIG. 5A illustrates a perspective view of an example of the RFID-enabled storage bin concealing an RFID tag at a first position along a slide channel according to various embodiments of the present disclosure.

[0022] FIG. 5B illustrates a perspective view of an example of the RFID-enabled storage bin exposing the RFID tag for detection at a second position along the slide channel according to various embodiments of the present disclosure.

[0023] FIG. 6A illustrates a perspective view of an example of an RFID-enabled coiled spring bin at a first position along the slide channel according to various embodiments of the present disclosure.

[0024] FIG. 6B illustrates a perspective view of the RFID-enabled coiled spring bin in FIG. 6A at a second position along the slide channel according to various embodiments of the present disclosure.

[0025] The drawings illustrate only exemplary embodiments and therefore should not be considered limiting of the scope of the embodiments described herein, as other equally effective embodiments are within the scope and spirit of this disclosure. The elements and features shown in the drawings are not necessarily drawn to scale, emphasis instead being placed upon clearly illustrating the principles of the exemplary embodiments. Additionally, certain dimensions or positionings may be exaggerated to help visually convey certain principles. In the drawings, similar reference numerals between figures designates like or corresponding, but not necessarily identical, elements.

DETAILED DESCRIPTION

[0026] Typically, a storage bin is a container used to hold multiple items. In some scenarios, various storage bins may each be used for bulk storage of identical items. As items are retrieved, individual storage bins may run out of their particular item at different rates. In that context, the present disclosure relates to automated tracking of inventory levels of items contained in storage bins.

[0027] In particular, various embodiments of the present disclosure relate to a radio frequency identification (RFID)-enabled storage bin that can be used to create an indication of inventory levels of items in the storage bin. For example, in some situations, there may be multiple RFID-enabled storage bins in an area. When a respective RFID-enabled storage bin reaches a threshold (e.g. near-empty or empty), the RFID-enabled storage bin can be configured to enable an RFID tag to be

read by an RFID reader. More specifically, the RFID-enabled storage bin can use an adjustable bin divider that masks an RFID tag from detection when the RFID-enabled storage bin has sufficient inventory and unmask the RFID tag in situations where the inventory needs to be restocked. In addition, the RFID tag can contain data that indicates a particular RFID-enabled storage bin, a particular item and a particular location within a facility. An RFID antenna that detects the RFID tag may be fixed to a known location. Accordingly, a location of the item that needs to be restocked can be identified by the RFID tag and/or the RFID antenna.

[0028] The present disclosure of the various embodiments has several advantages over existing storage solutions. For instance, the various embodiments of the present disclosure enable automated inventory level tracking of items in various storage bins. This functionality reduces the amount of time required to replenish stock. Typically, storage bins have to be manually checked to determine the inventory levels for each storage bin. Thus, the embodiments of the present disclosure can substantially minimize, if not entirely eliminate, the time needed to determine which storage bins need to be replenished. In addition, the automated inventory level tracking can also be integrated into other supply chain operations such as automating the placement of purchase orders for items that need to be replenished.

[0029] In the following paragraphs, the embodiments are described in further detail by way of example with reference to the attached drawings. In the description, well known components, methods, and/or processing techniques are omitted or briefly described so as not to obscure the embodiments. Turning now to the drawings, a general description of exemplary embodiments of an RFID-enabled

storage bin and its components are provided, followed by a discussion of the operation of the system.

[0030] With reference to FIG. 1, shown is a networked environment 100 according to various example embodiments. The networked environment 100 includes RFID-enabled storage bins 103a-103d (collectively “RFID-enabled storage bins 103”), RFID antennas 106a and 106b (collectively “RFID antennas 106”), an RFID reader 109, and a networked connected storage device 112. Each RFID-enabled storage bin 103 may include a container of varying size and shape. The RFID-enabled storage bins 103 can be used for bulk storage of identical items. In some embodiments, among others, the RFID-enabled storage bin 103 may include, for example, an adjustable bin divider (FIG. 4A) that has an RFID tag (FIG. 2B). In other embodiments, among others, the RFID-enabled storage bin 103 can have the RFID tag positioned along an interior wall or a bottom portion. The RFID tag may be a passive or active RFID tag.

[0031] The RFID-enabled storage bins 103 can be in data communication with an RFID reader 109, via the RFID antennas 106. Each RFID antenna 106 can be positioned at a fixed location to transmit data to and/or receive data from one or multiple RFID-enabled storage bins 103. The data is transmitted and received in a form of radiated energy.

[0032] The RFID reader 106, also known as an interrogator, can be electrically coupled to one or more RFID antennas 109. The RFID reader 109 can be used to provide a data connection between the RFID tag and the network connected storage device 112, via the network 114. The RFID reader 106 may comprise, for example, a chipset, a module, or other suitable integrated form factors. The networked connected storage device 112 may comprise, for example, a server computer or any

other system providing computing capability. Alternatively, the networked connected storage device 112 may employ a plurality of storage devices arranged, for example, in one or more server or computer banks or other arrangements. Such storage devices may be located in a single installation or distributed among different geographical locations. For example, the networked connected storage device 112 may include a plurality of computing devices and storage devices that together comprise a cloud computing resource, a grid computing resource, and/or any other distributed computing arrangement. In some embodiments, among others, the RFID reader 109 and the networked connected storage device 112 can be employed as a real-time location system (RTLS) 115. In these embodiments, among others, the RTLS 115 can operate to provide in real-time, or nearly real-time, a location of the RFID-enabled storage bin 103 that needs to be replenished with inventory. The network 114 may include, for example, the Internet, intranets, extranets, wide area networks (WANs), local area networks (LANs), wired networks, wireless networks, or other suitable networks, etc., or any combination of two or more such networks.

[0033] Next, a general description of the operation of the various components of the networked environment 100 is provided. To begin, multiple RFID-enabled storage bins 103 may each contain different levels of inventory. In a situation where there is sufficient inventory, an RF-blocking slide divider (FIG. 4A) masks the RFID tag from being detected by the RFID antennas 106. Accordingly, the RFID reader 109 is prevented from receiving data from the RFID tag. As inventory is removed, the RF-blocking slide divider moves toward a front portion of the RFID-enabled storage bin 103. When the inventory level reaches a threshold, the RF-blocking slide divider will have moved far enough away from the RFID tag that it can be detected by the RFID antenna 106. In this situation, the RFID reader 109 can

receive data from the RFID tag. The received data may include, for example, a bin identifier, a bin location, a product identifier, or other suitable data associated with the RFID-enabled storage bin 103. The RFID reader 109 can also receive an indication as to which RFID antenna 106 detected the RFID tag. This information can be used to determine a location of the RFID-enabled storage bin 103 that needs to be replenished. In some scenarios, the detection of the RFID tag can initiate the placement of purchase orders for the items associated with the RFID-enabled storage bin 103. Particularly, the detection of the RFID tag can initiate transmitting a purchase order to a remote computing device over the network 114.

[0034] Referring next to FIG. 1B, shown is a perspective view of a storage bin rack 120 according to various embodiments of the present disclosure. As shown in FIG. 1B, the storage bin rack 120 may include multiple RFID-enabled storage bins 103 at different inventory levels. As discussed above, the RFID antennas 106 can be positioned to detect multiple RFID-enabled storage bins 103 when inventory levels reach a threshold. In some embodiments, among others, a shelf in the storage bin rack 120 may be oriented at an incline. As a result, the RFID-enabled storage bins 103 are positioned at an incline and gravity facilitates moving the RF-blocking slide divider toward the front portion of the RFID-enabled storage bins 103 as items are removed. As one non-limiting example, the shelf is configured such that the RFID-enabled storage bins 103 are inclined at least 30 degrees with respect to a horizontal reference plane, such as a shelf or the floor.

[0035] With respect to FIG. 2A, shown is a top side perspective view of a supporting base 200 associated with the RFID-enabled storage bin 103. As shown in the illustrated embodiment, the supporting base 200 may comprise, for example, a first end 203 and a second end 206. The supporting base 200 can have a receiving

slot 209 at the first end 203. The receiving slot 209 may comprises a slide channel 212 that extends along a portion of the top side of the supporting base 200. An RF-blocking slide divider (FIG. 3) can be inserted in the receiving slot 209. A support member (FIG.3) or a narrowed end of a divider panel can fit within the slide channel 212. Accordingly, the RF-blocking slide divider can move along the slide channel 212.

[0036] With respect to FIG. 2B, shown is a perspective bottom side view of the supporting base 200 associated with the RFID-enabled storage bin 103. A bottom side of the supporting base 200 may comprise an RFID tag 215. The RFID tag 215 can be a passive or active RFID tag. Although shown as being near the first end 203, the RFID tag 215 can be positioned at various locations on the supporting base 200. In some embodiments, among others, the RFID tag 215 may be positioned at different locations to correspond to a particular level of inventory remaining in the RFID-enabled storage bin 103 when the RFID tag 215 is detected. For example, in FIG. 2B, the RFID tag 215 is positioned near the first end 203. As items are removed, the RF-blocking slide divider (FIG. 3) moves toward the second end 206 along the slide channel 212. When the RF-blocking slide divider moves far enough away from the RFID tag 21, the RFID antenna 106 will detect the RFID tag 215. At this position along the slide channel 212, the location of the RF-blocking slide divider may correspond to 50% remaining inventory in the RFID-enabled storage bin 103. As another non-limiting example, the RFID tag 215 may be positioned at a substantially equal distance from the first end 203 and the second end 206 of the supporting base 200. In this example, when the RFID tag 215 is detected, it may correspond to the RFID-enabled storage bin 103 being empty or nearly-empty of inventory.

[0037] With reference to FIG. 3, shown is a cross sectional view of an RF-blocking slide divider 300 of the RFID-enabled storage bin 103 according to various embodiments of the present disclosure. As shown in FIG. 3, the RF-blocking slide divider 300 may comprise, for example, a base panel 303 and a divider panel 306. In some embodiments, the base panel 303 is connected to divider panel 306 by way of a support member 309. The support member 309 can have a narrow width such that it fits within the slide channel 212 of the supporting base 200. In some embodiments, among others, the support member 309 may be omitted and the divider panel 306 may have a narrowed end that is connected to the base panel 303. The narrowed end can be of an appropriate size such that it fits within the slide channel 212. In addition, the base panel 303 may include an RF shield 312. The RF shield 312 may comprise, for example, a metal foil, a metal sheet, a metal screen, a metal foam, a metal tape, or other suitable forms of RF shielding. The RF shield 312 may be comprised of aluminum, copper, nickel, lead, iron, or other suitable RF shielding material elements.

[0038] As discussed above, the RF-blocking slide divider 300 can be inserted within the receiving slot 209. In particular, the base panel 303 is inserted within the receiving slot 209. When inserted, the divider panel 306 can be outside of the receiving slot 209. The divider panel 306 can be used to push inventory items toward a front portion of the RFID-enabled storage bin 103.

[0039] Referring next to FIG. 4A, shown is a perspective view of an adjustable bin divider 400. The adjustable bin divider 400 may include, for example, the RF-blocking slide divider 300 (FIG. 3) inserted within the supporting base 200 from FIGS. 2A and 2B. Additionally, FIG. 4A displays a cross sectional reference “AA” for

FIG. 4B. The arrows associated with the “AA” cross sectional reference in FIG. 4A provide an indication of the direction of the cross sectional view for FIG. 4B.

[0040] Moving on to FIG. 4B, shown is a cross sectional view of the adjustable bin divider 400. In FIG. 4B, the adjustable bin divider 400 is shown with the RF-blocking slide divider 300 (FIG. 3) inserted within the supporting base 200 from FIGS. 2A and 2B. As shown, the RF shield 312 can substantially cover the RFID tag 215. In this situation, the RFID tag 215 is concealed from being detected by the RFID antennas 106 at the illustrated position. As the base panel 303 moves further into the receiving slot 209 and toward the second end 206, the RF shield 312 moves away from the RFID tag 215. Once at an appropriate position, the RFID tag 215 can be detected by the RFID antenna 106 and data can be communicated from the RFID tag 215 to the RFID reader 109.

[0041] With regard to FIG. 5A, shown is a perspective view of the RFID-enabled storage bin 103 concealing an RFID tag at a first position along the slide channel 212 according to various embodiments of the present disclosure. As shown in the illustrated embodiment, the RFID-enabled storage bin 103 may comprise, for example, the supporting base 200, the RF-blocking slide divider 300, and a storage bin 500. The storage bin 500 can have a front portion 503 and a back portion 506. In some embodiments, among others, the storage bin 500 has a first opening near the front portion 503 and a second opening at the top of the storage bin 500. These openings provide access to items contained within the RFID-enabled storage bin 103. As one skilled in the art can appreciate, storage bins 500 can be manufactured in varying sizes and designs.

[0042] In the illustrated embodiment, the RFID-enabled storage bin 103 may be configured such that the adjustable bin divider 400 is presently in a position that

conceals the RFID tag 215, as shown in FIG. 4B, from being detected by the RFID antenna 106. As one non-limiting example, the RFID-enabled storage bin 103 may contain multiple inventory items on a top portion of the supporting base 200 and in front of the divider panel 306. As inventory items are removed, the RF-blocking slide divider 300 moves toward the front portion 503 of the storage bin 500 along the slide channel 212.

[0043] Turning to FIG. 5B, shown is a perspective view of the RFID-enabled storage bin 103 exposing an RFID tag at a second position along the slide channel 212 according to various embodiments of the present disclosure. As the RF-blocking slide divider 300 moves forward, the RF shield 312 can be moved away from the RFID tag 215. Once at an appropriate distance, the RFID tag 215 can be exposed to the RFID antennas 106, which can facilitate data communication between the RFID tag 215 and the RFID reader 109.

[0044] As another non-limiting example, the RF-blocking slide divider 300 can move from the first position to the second position, as shown in FIG. 5B, in response to gravity. For instance, in some embodiments, among others, the RFID-enabled storage bin 103 or the adjustable bin divider 400 can be positioned at an incline. At an inclined position, gravity can facilitate the RF-blocking slide divider 300 moving toward the front portion 503 of the storage bin 500 as inventory items are removed. In one embodiment, among others, the RF-blocking slide divider 300 may be positioned at an incline of at least 30 degrees with respect to a horizontal reference plane, such as a shelf or the floor. The RF-blocking slide divider 300 can also push the remaining inventory items toward the front portion 503 of the storage bin 500.

[0045] In some embodiments, among others, the RFID-enabled storage bin 103 may have the supporting base 200 integrated within a portion of the storage bin 500.

For instance, a storage bin can have a receiving slot formed from a bottom portion of the storage bin and an elevated platform that includes a slide channel. In this non-limiting example, the RF-blocking slide divider 300 can then be inserted into the receiving slot. As one skilled in the art can appreciate, the receiving slot can be formed using other portions of the storage bin.

[0046] With respect to FIG. 6A, shown is a perspective view of an RFID-enabled coiled spring bin 600 at a first position along the slide channel 212 according to various embodiments of the present disclosure. The RFID-enabled coiled spring bin 600 may comprise, for example, the adjustable bin divider 400 positioned within the storage bin 500. The RFID-enabled coiled spring bin 600 may also include a coiled spring 603 attached to an interior wall of the storage bin 500 and the divider panel 306. In FIG. 6A, the coiled spring 603 is shown in a compressed state. The coiled spring 603 may include a spring-loaded plunger or other suitable spring devices.

[0047] As a non-limiting example, the RFID-enabled coiled spring bin 600 can contain multiple inventory items. As discussed above, the inventory items may be placed on a top portion of the supporting base 200 and in front of the divider panel 306. In some embodiments, among others, the inventory items within the RFID-enabled coiled spring bin 600 can facilitate keeping the coiled spring 603 from pushing the divider panel 306 toward the front portion 503 of the storage bin 500. For instance, a quantity and/or a collective weight of the inventory items can facilitate keeping the coiled spring 603 and the divider panel 306 at a particular position. As an item is removed, the coiled spring 603 can extend its length and as a result, push the divider panel 306 of the RF-blocking slide divider 300 along the slide channel 212 toward the front portion 503 of the storage bin 500.

[0048] Turning to FIG. 6B, shown is a perspective view of the RFID-enabled coiled spring bin 600 at a second position along the slide channel 212 according to various embodiments of the present disclosure. As discussed above, the divider panel 306 of the RF-blocking slide divider 300 (FIG. 3) moves toward the front portion 503 of the storage bin 500 when items are removed. As shown in FIG. 6B, after an item is removed, the coiled spring 603 can expand. As such, the coiled spring 603 pushes the divider panel 306 forward and in turn, the divider panel 306 can push the remaining inventory items toward the front portion 503 of the storage bin 500.

[0049] Although embodiments have been described herein in detail, the descriptions are by way of example. The features of the embodiments described herein are representative and, in alternative embodiments, certain features and elements may be added or omitted. Additionally, modifications to aspects of the embodiments described herein may be made by those skilled in the art without departing from the spirit and scope of the present invention defined in the following claims, the scope of which are to be accorded the broadest interpretation so as to encompass modifications and equivalent structures.

CLAIMS

Therefore, at least the following is claimed:

1. An adjustable bin divider, comprising:
 - a supporting base that has a receiving slot at an end, the receiving slot comprising a slide channel that extends along a portion of a top side of the supporting base;
 - a radio frequency identification (RFID) tag that is attached to the supporting base; and
 - a radio frequency (RF)-blocking slide divider that comprises a first panel with an RF shield and a second panel that has a narrowed end, the first panel being connected to the second panel at the narrowed end, the first panel being inserted in the receiving slot, the narrowed end fitting within the slide channel of the receiving slot, wherein the RF-blocking slide divider conceals the RFID tag from detection from an RFID reader at a position along the slide channel.
2. The adjustable bin divider of claim 1, wherein the position comprises a first position and the adjustable bin divider is positioned at an incline and the RF-blocking slide divider moves from the first position to a second position along the slide channel in response to gravity.
3. The adjustable bin divider of any of claims 1 and 2, wherein the adjustable bin divider is positioned within a storage bin.

4. The adjustable bin divider of claim 3, further comprising a coiled spring that is attached to a back panel of the storage bin and the second panel of the RF-blocking slide divider.

5. The adjustable bin divider of claim 4, wherein the position comprises a first position and wherein the RF-blocking slide divider moves from the first position to a second position along the slide channel in response to the coiled spring pushing the second panel away from the back panel of the storage bin.

6. The adjustable bin divider of any of claims 1-5, wherein the RF shield is positioned substantially over the RF tag.

7. The adjustable bin divider of any of claims 1-6, wherein the RF shield comprises at least one of a metal foil, a metal sheet, a metal screen, a metal tape, or a metal foam.

8. The adjustable bin divider of any of claims 1-7, wherein the RF shield comprises at least one of aluminum, copper, nickel, lead, or iron.

9. The adjustable bin divider of any of claims 1-8, wherein the second panel is oriented in a plane different from the first panel.

10. An apparatus, comprising:
 - a storage bin;
 - a radio frequency identification (RFID) tag that is attached to an interior portion of the storage bin;
 - a supporting base that is positioned within the storage bin and has a receiving slot at an end, the receiving slot comprising a slide channel that extends along a top portion of the supporting base; and
 - a radio frequency (RF)-blocking slide divider that comprises a base panel and a divider panel that has a narrowed end, the base panel being connected to the divider panel at the narrowed end, the divider panel comprising an RF shield, the base panel being inserted in the receiving slot, the narrowed end fitting within the slide channel, wherein the RF-blocking slide divider conceals the RFID tag from detection from an RFID reader at a position along the slide channel.
11. The apparatus of claim 10, wherein the supporting base is positioned at an incline within the storage bin.
12. The apparatus of any of claims 10 and 11, wherein the position along the slide channel is substantially near the end of the supporting base with the receiving slot.

13. The apparatus of any of claims 10-12, wherein the position comprises a first position and wherein the RF-blocking slide divider moves along the slide channel of the receiving slot from the first position to a second position, wherein the second position is substantially near a distal end away from the receiving slot of the supporting base.

14. The apparatus of any of claims 10-13, further comprising a coiled spring that is attached to the divider panel and the interior portion of the storage bin.

15. The apparatus of any of claims 10-14, wherein the RFID reader is in data communication with a network connected storage device.

16. An apparatus, comprising:

a storage bin that comprises an elevated platform, the elevated platform and a bottom portion of the storage bin forming a receiving slot, the receiving slot comprises a slide channel that extends along a portion of the elevated platform;

a radio frequency identification (RFID) tag that is attached to a portion of the storage bin; and

a radio frequency (RF)-blocking slide divider that comprises a base panel connected to a divider panel that has a narrowed end, the base panel being inserted in the receiving slot, the narrowed end fitting within the slide channel, wherein the RF-blocking slide divider comprises an RF shield and conceals the RFID tag from detection from an RFID reader at a position along the slide channel.

17. The apparatus of claim 16, wherein the RFID tag is attached to a bottom portion of the storage bin or a back panel of the storage bin.

18. The apparatus of any of claims 16 and 17, wherein the RF shield is attached to a portion of the divider panel.

19. The apparatus of any of claims 16-18, wherein the RF shield is attached to the base panel.

20. The apparatus of any of claims 16-19, further comprising a coiled spring that is attached to an interior wall of the storage bin and the divider panel.

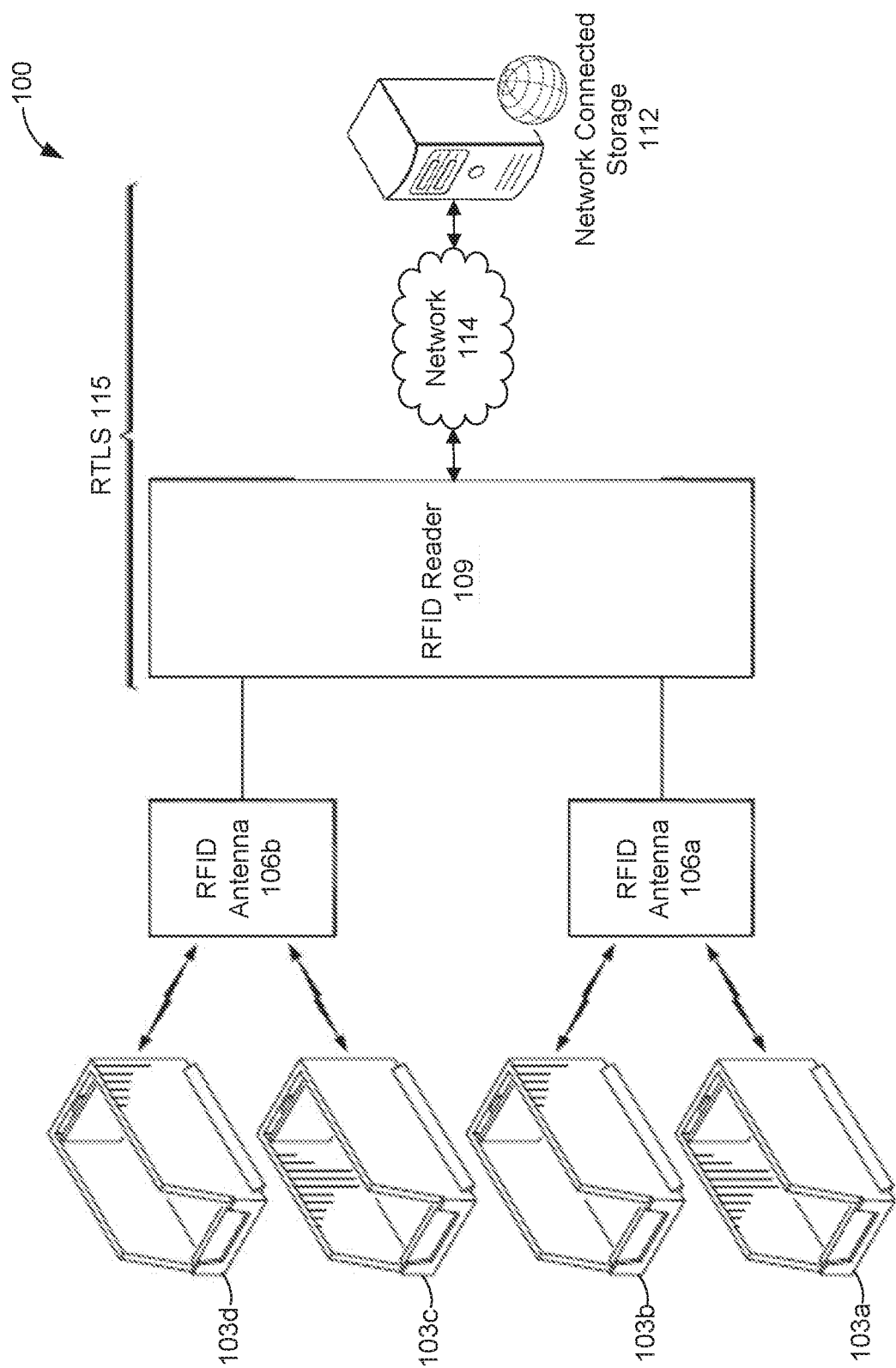


FIG. 1A

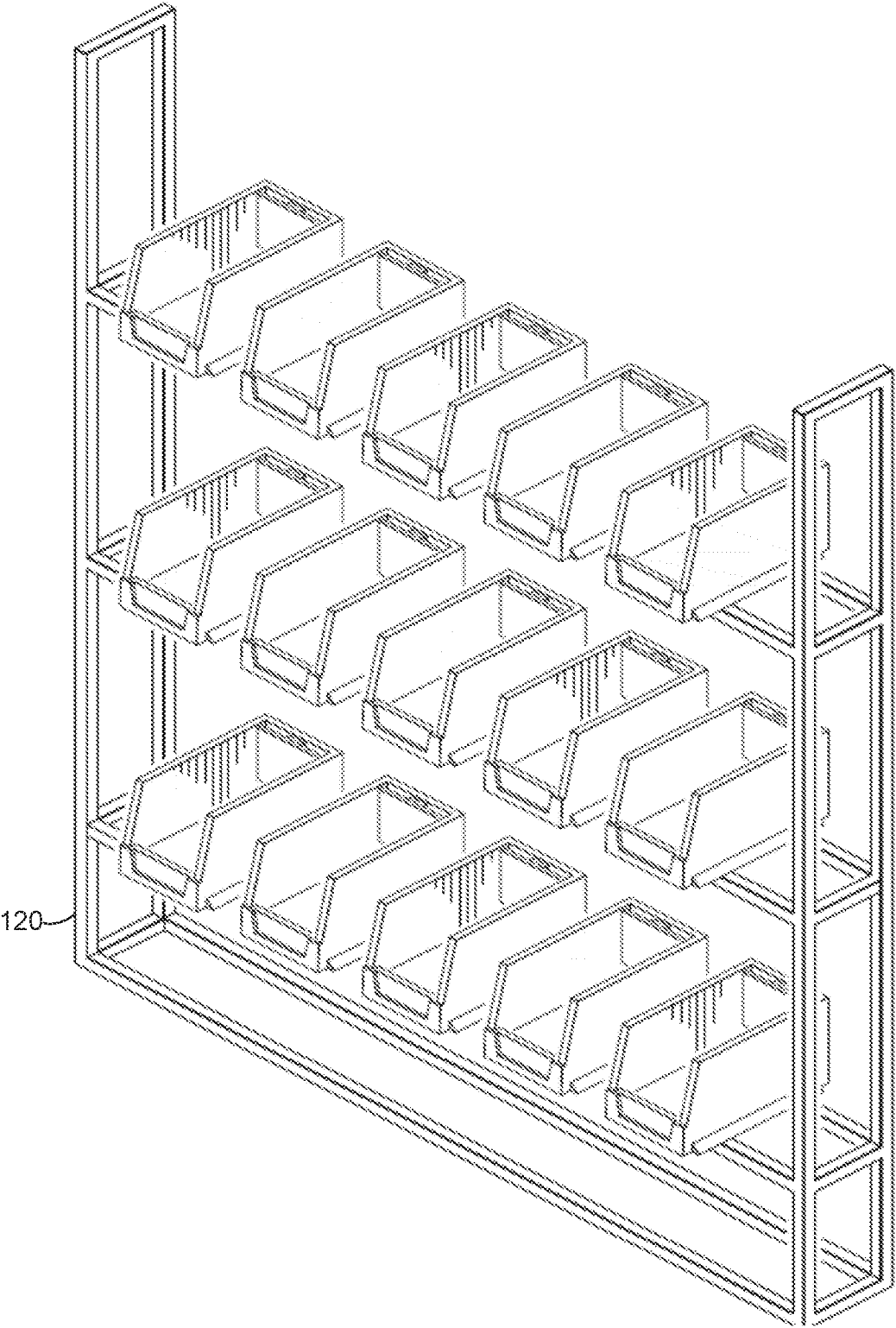


FIG. 1B

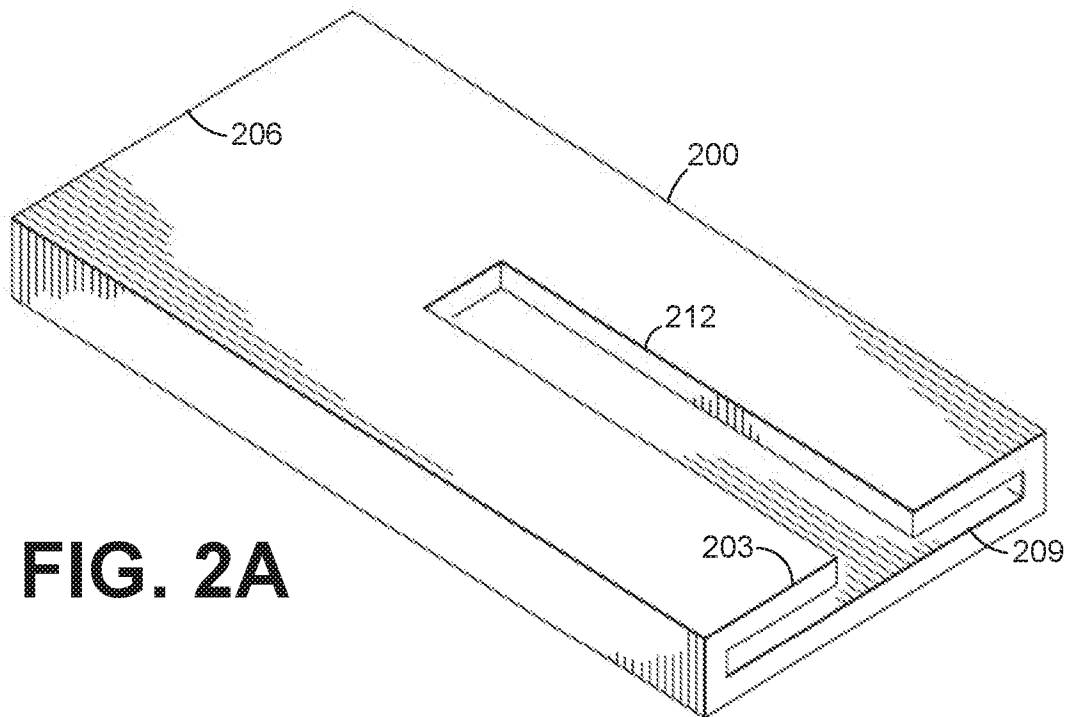


FIG. 2A

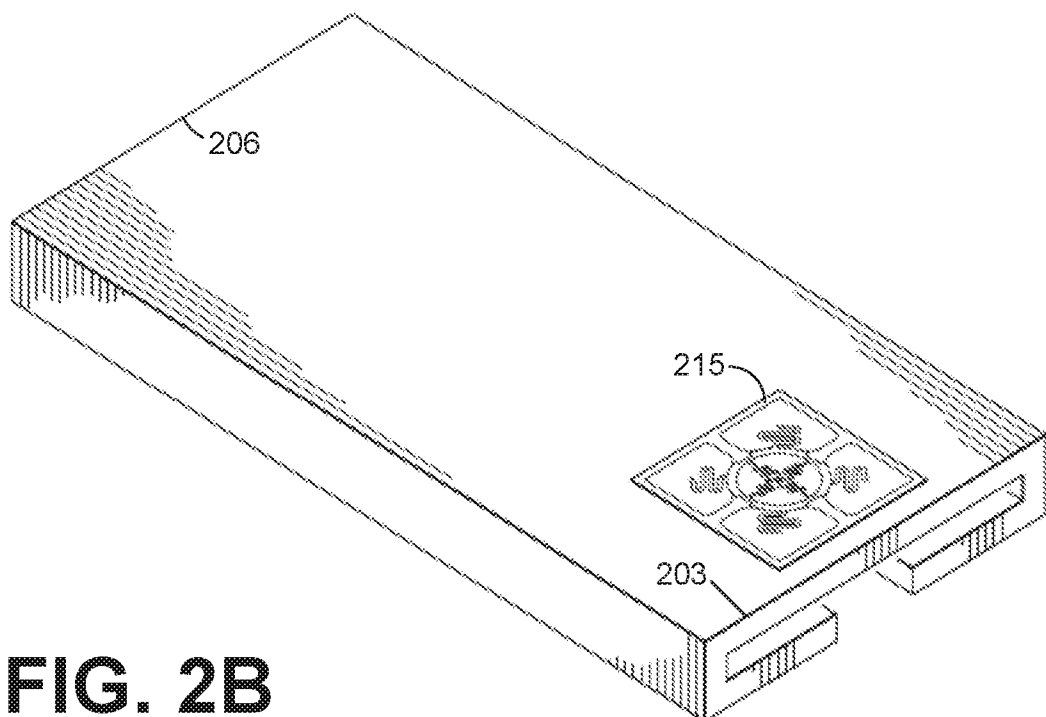


FIG. 2B

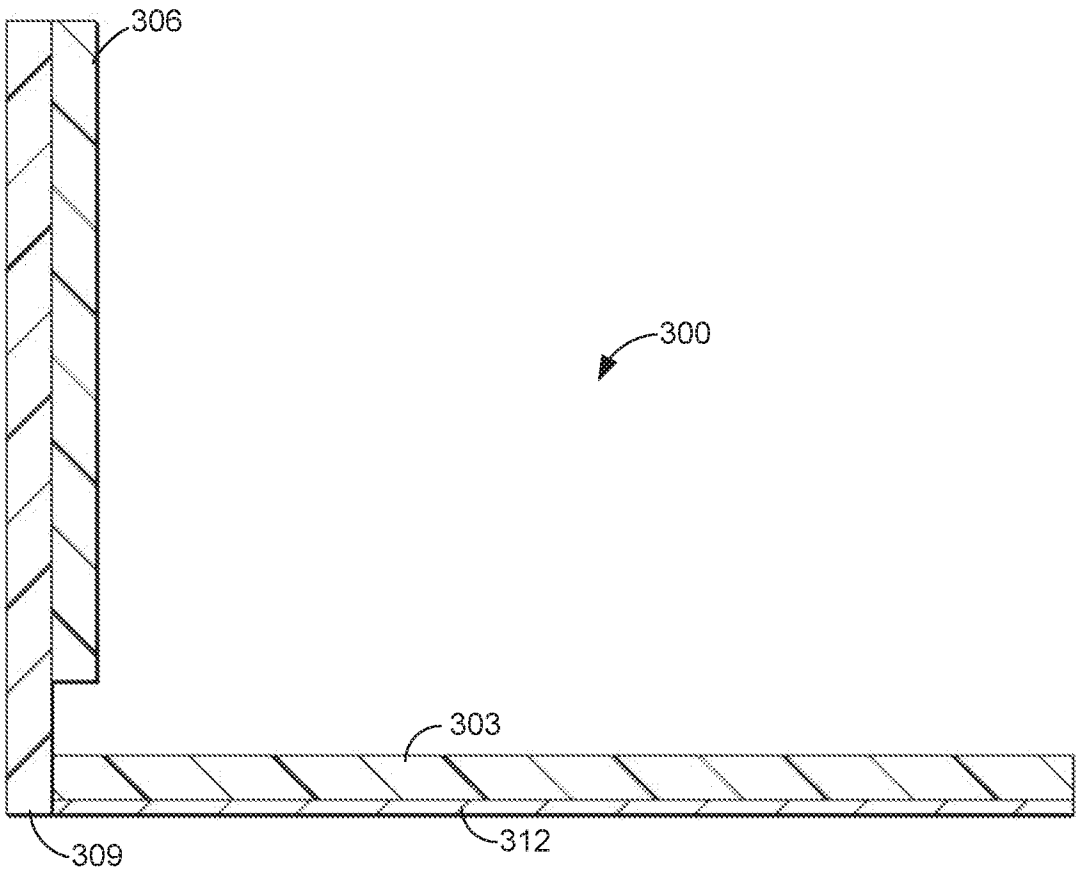


FIG. 3

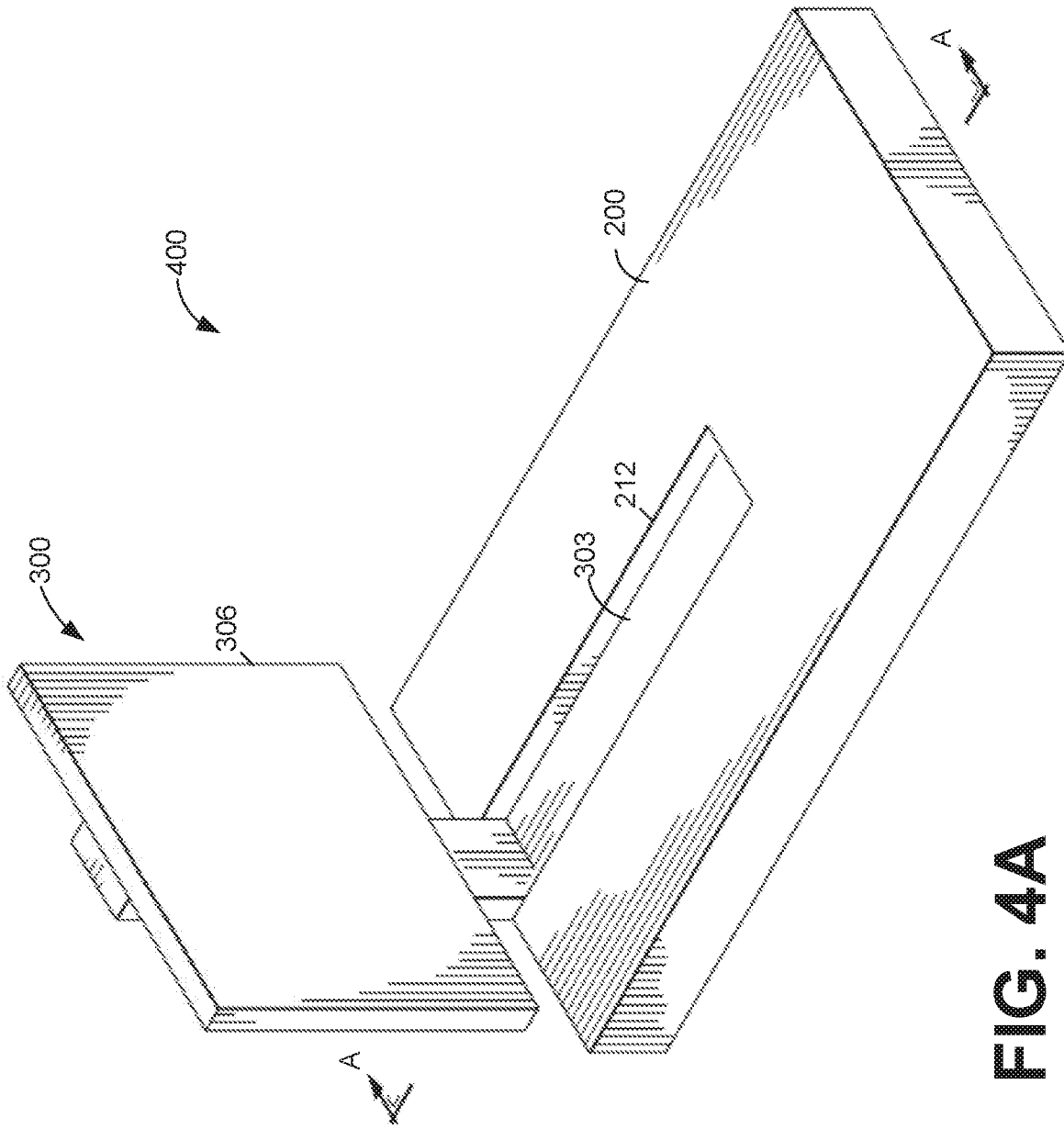


FIG. 4A

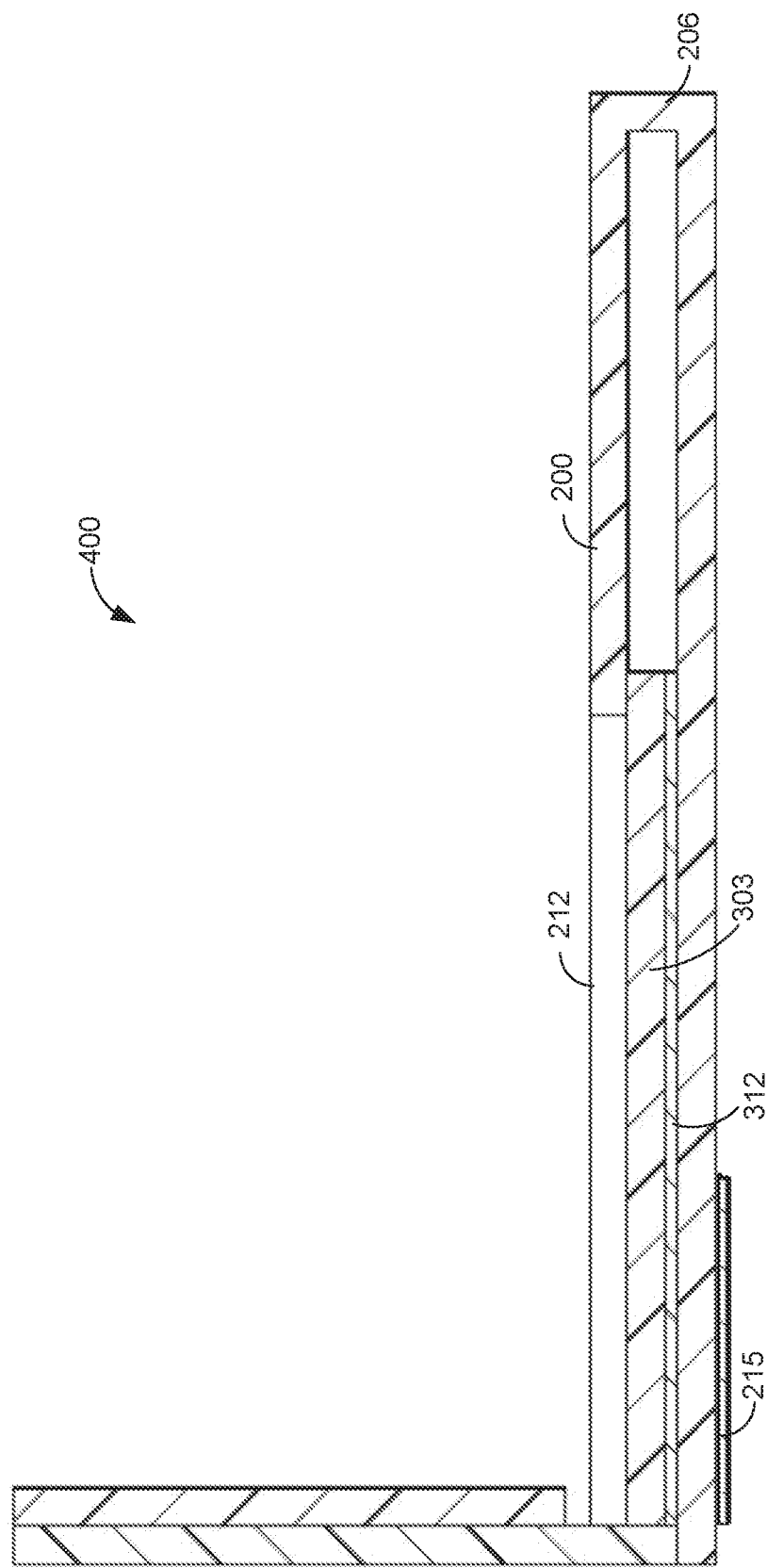


FIG. 4B

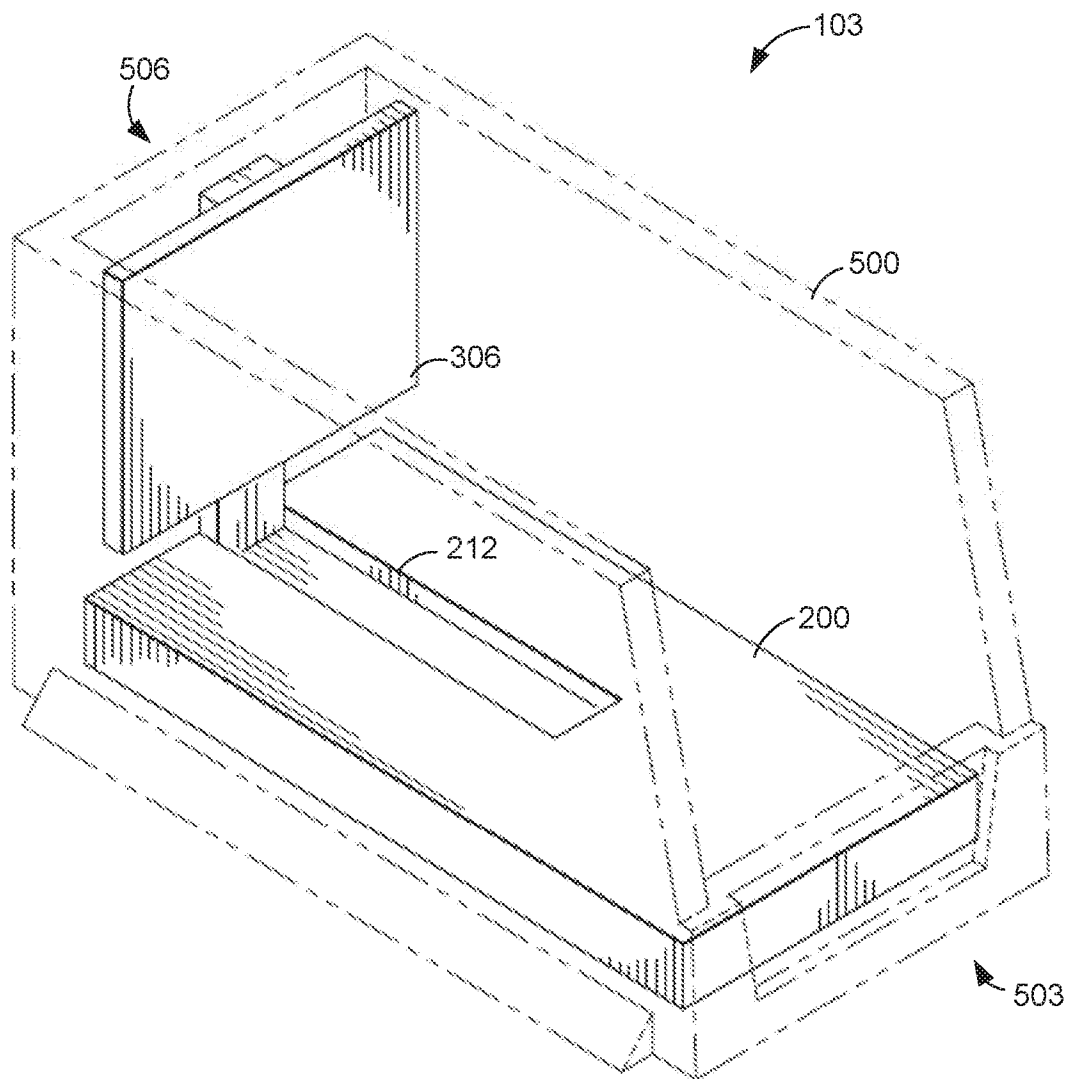


FIG. 5A

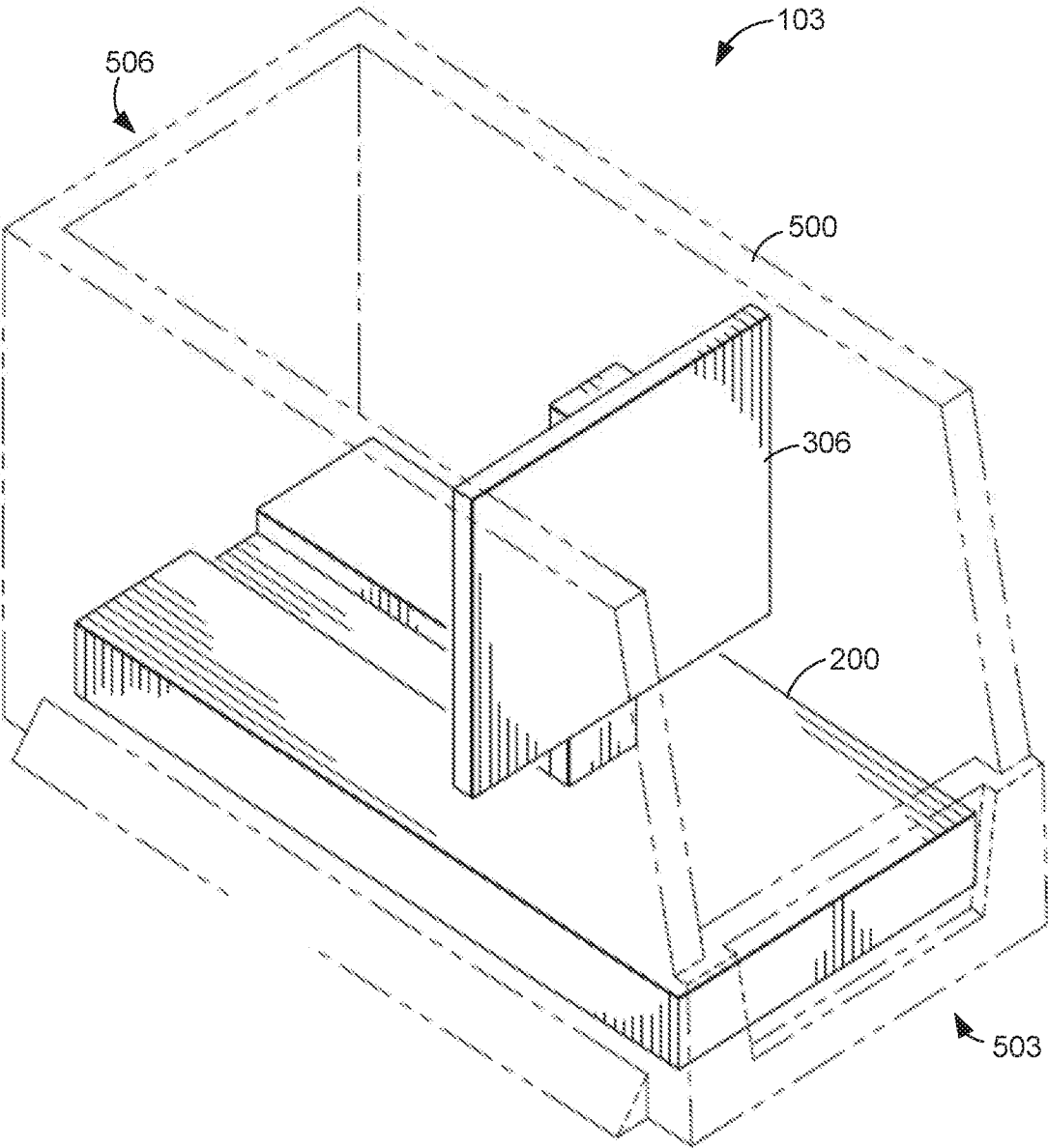


FIG. 5B

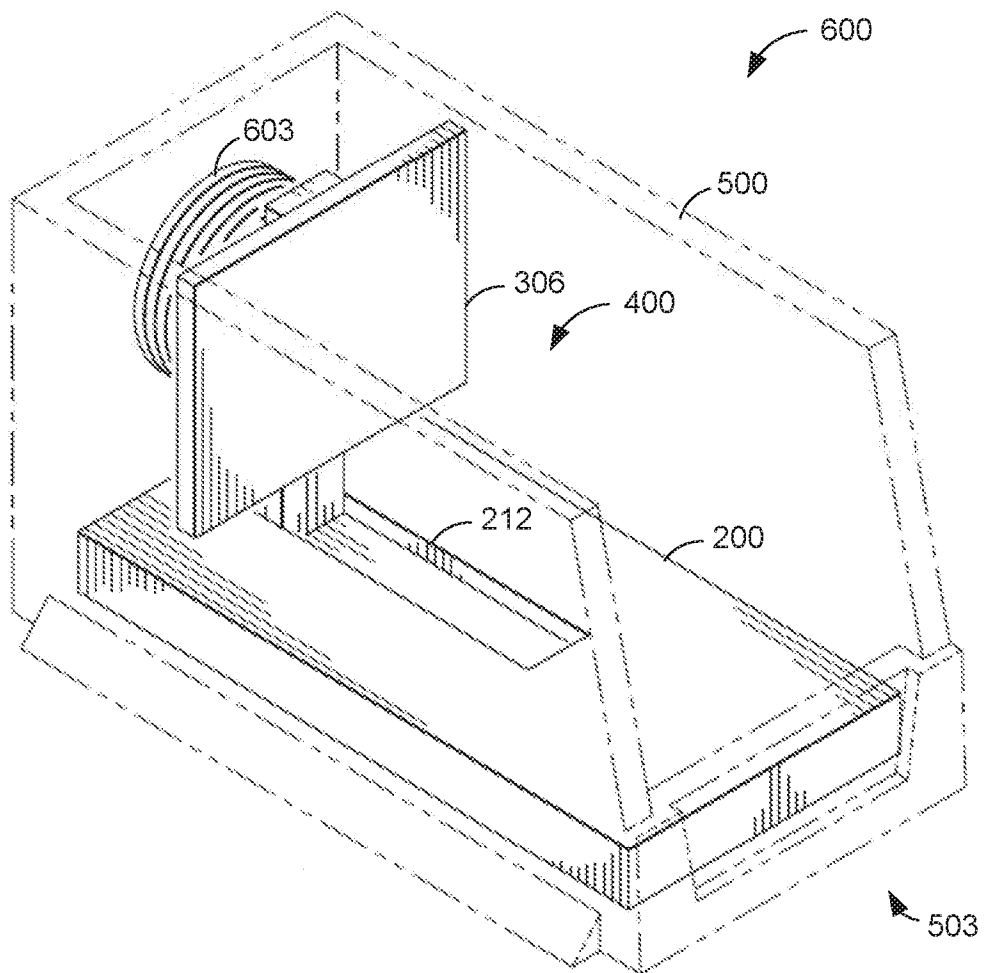


FIG. 6A

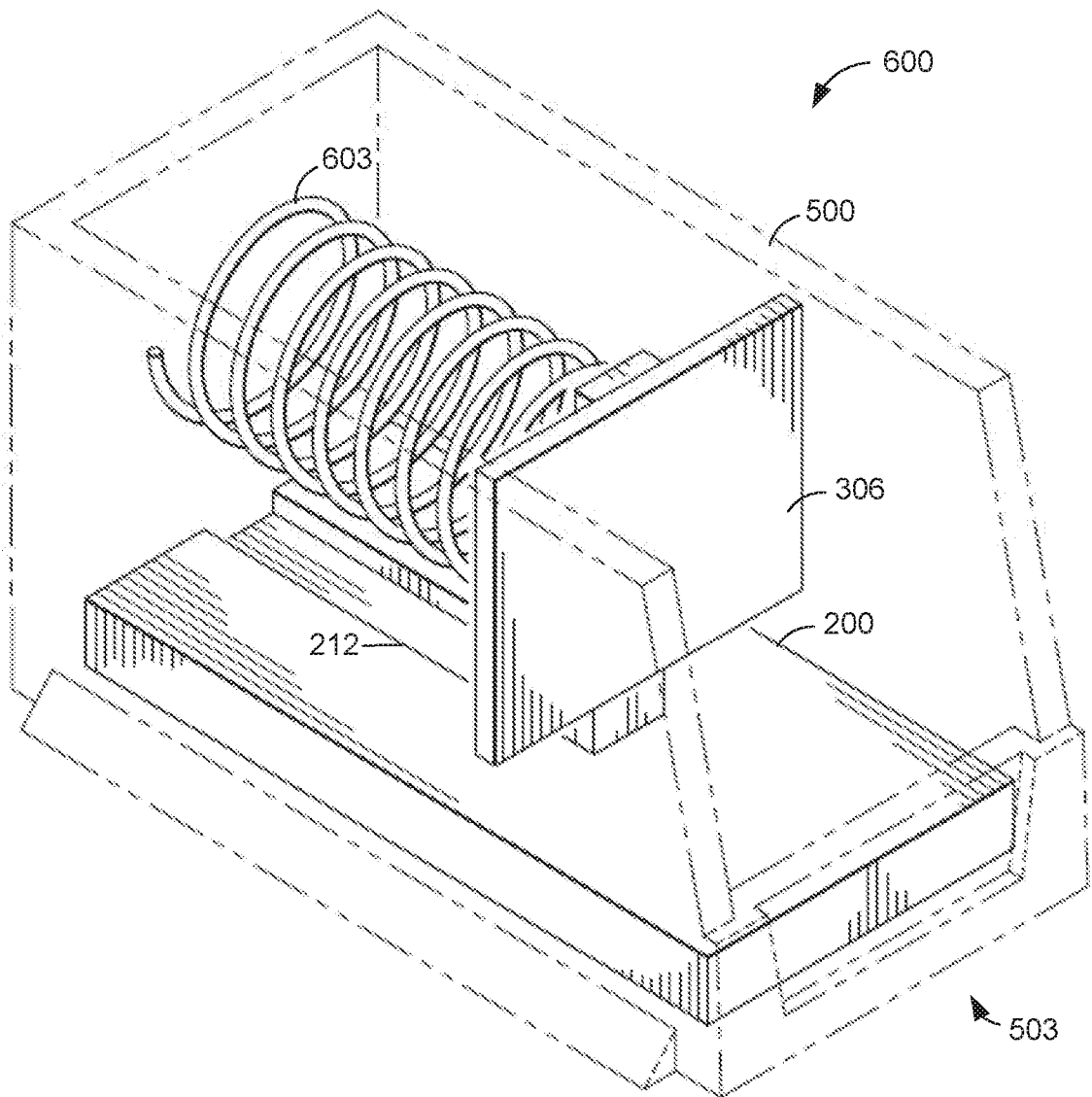


FIG. 6B

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2017/031247

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B65D 25/04; G06Q 10/08; G06Q 10/087; H01Q 1/22 (2017.01)

CPC - B65D 25/04; B42F 17/02; B65D 2203/04; B65D 2203/10; G06Q 10/08; G06Q 10/087; G06Q 10/0875; H01Q 1/2216 (2017.05)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

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

USPC - 211/59.3; 211/133.6; 211/184; 220/549; 235/385; 700/214 (keyword delimited)

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

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,111,942 A (BERNARDIN) 12 May 1992 (12.05.1992) entire document	1-5, 10-12, 16-18
Y	US 2013/0048724 A1 (BURNSIDE et al) 28 February 2013 (28.02.2013) entire document	1-5, 10-12, 16-18
Y	US 4,651,883 A (GULLETT et al) 24 March 1987 (24.03.1987) entire document	2-5, 10-12
A	US 2005/0040934 A1 (SHANTON) 24 February 2005 (24.02.2005) entire document	1-5, 10-12, 16-18
A	US 8,738,474 B1 (MCHUGH et al) 27 May 2014 (27.05.2014) entire document	1-5, 10-12, 16-18
A	US 2013/0310967 A1 (OLSON et al) 21 November 2013 (21.11.2013) entire document	1-5, 10-12, 16-18

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

07 July 2017

Date of mailing of the international search report

01 AUG 2017

Name and mailing address of the ISA/US

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2017/031247

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 6-9, 13-15, 19, 20
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.