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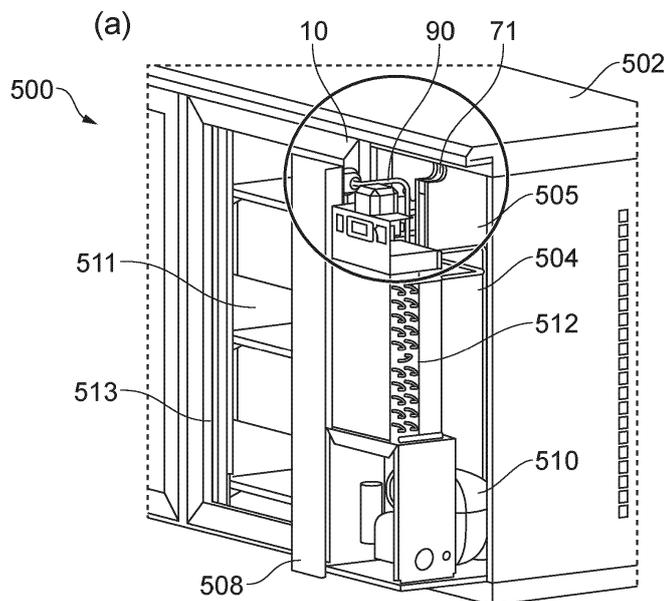
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(54) **REFRIGERATOR**

(57) The present invention provides a refrigerator (500) comprising:  
a refrigerated area (511) and a cabinet (505);  
a separation wall (504) dividing the refrigerated area and the cabinet;  
a refrigeration system comprising an evaporator disposed in the refrigerated area, a condenser unit (512) disposed in the cabinet and a conduit (90) connecting the

condenser unit with the evaporator, wherein the conduit extends through the separation wall; and  
a conduit support (10) having an opening through which the conduit extends,  
wherein the separation wall comprises a recess (71) shaped to receive the conduit support such that the conduit support can be separated from the separation wall for removal of the condenser unit from the cabinet.



**FIG. 1**

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**Description**

**[0001]** The invention relates generally to a refrigerator.

**Background**

**[0002]** Refrigerators are commonly used to store and to cool products such as food and beverages. Refrigerators operate by circulating a refrigerant around a conduit circuit so that the refrigerant absorbs and removes heat from an area containing the products, and expels the heat to the surroundings. This creates a refrigerated area where the products are stored, and a surrounding area where the heat is expelled. Refrigerators typically have a wall that separates the refrigerated area from the surrounding area to prevent heat transfer from one to the other.

**[0003]** To facilitate the passage of refrigerant between the refrigerated area and the surround area, a pipe extends through the wall. However, this arrangement makes it difficult and time-consuming to service the refrigerator, as it prevents access to the condenser unit of the refrigerator. In particular, the condenser unit needs to be removed in order to inspect, clean and repair the refrigerator. In some instances, the condenser unit needs to be replaced altogether. Having a pipe going through the wall between the refrigerated area and the surrounding area makes it difficult to access and/or remove the condenser unit of the refrigerator.

**[0004]** It would be desirable to provide a refrigerator that addresses the above problems.

**Summary of the Invention**

**[0005]** In accordance with the present invention there is provided a refrigerator according to the appended claims.

**[0006]** According to an aspect of the present invention, there is provided a refrigerator comprising:

a refrigerated area and a cabinet;

a separation wall dividing the refrigerated area and the cabinet;

a refrigeration system comprising an evaporator disposed in the refrigerated area, a condenser unit disposed in the cabinet and a conduit connecting the condenser unit with the evaporator, wherein the conduit extends through the separation wall; and

a conduit support having an opening through which the conduit extends,

wherein the separation wall comprises a recess shaped to receive the conduit support such that the conduit support can be separated from the separation wall for removal of the condenser unit from

the cabinet.

**[0007]** Thus, instead of having a conduit that is fixed within the separation wall between the refrigerated area and the cabinet, the conduit is held within the conduit support that can be received within and separated from the separation wall. When a refrigerator needs to be serviced, the conduit support, along with the conduit, can be removed from the separation wall to remove the condenser unit from the cabinet. This improves access inside the refrigerator, making it easier and more efficient to service the refrigerator.

**[0008]** In examples, the condenser unit is removable from the cabinet in a removal direction, wherein the separation wall is parallel to the removal direction and the conduit extends perpendicularly to the separation wall.

**[0009]** In examples, the refrigerator has a front surface, wherein the refrigerated area has a door on the front surface, wherein the cabinet is located to a side of the refrigerated area and the condenser unit is removable from the front surface of the refrigerator. This is particularly advantageous because the condenser unit can be disconnected and removed from the front surface without needing access to the side and/or the rear of the refrigerator. This is especially beneficial where the refrigerator is a back bar refrigerator appliance, as access is primarily from the front.

**[0010]** In examples, the separation wall comprises a first wall panel proximal the refrigerated area and a second wall panel proximal the cabinet. In examples, the separation wall comprises insulation between the first wall panel and the second wall panel. In examples, the insulation is an insulation panel. In examples, the insulation panel is made from a foam material.

**[0011]** In examples, the recess is arranged between the first wall panel and the second wall panel.

**[0012]** In examples, an outer surface of the conduit support comprises a ridge.

**[0013]** In examples, the conduit support comprises a first support portion releasably attached to a second support portion.

**[0014]** In examples, the first support portion comprises a first portion of the ridge and the second support portion comprises a second portion of the ridge.

**[0015]** In examples, the recess comprises a groove sized and shaped to receive the ridge of the conduit support. In examples, the groove and the ridge are configured to form a seal when the ridge is received in the groove.

**[0016]** In examples, the first support portion defines a first conduit engaging surface and the second support portion defines a second conduit engaging surface, the first and second conduit engaging surfaces together defining the opening.

**[0017]** In examples, the conduit support is configured to seal against the recess and the conduit.

**[0018]** In examples, the conduit support thermally in-

ulates the conduit. In examples, the conduit support is shaped to prevent heat loss in the conduit. In examples, the conduit support is made of an insulating foam material.

**[0019]** In examples, the conduit support dampens vibrations of the conduit.

**[0020]** In examples, the conduit support comprises a cavity for receiving a mounting plate for attaching the conduit support to the condenser unit.

**[0021]** In examples, the first support portion and the second support portion each define a portion of the cavity.

**[0022]** In examples, a portion of the outer surface of the conduit support comprises a planar surface.

**[0023]** In examples, the planar surface is arranged flush with the mounting plate when the mounting plate is received in the cavity.

**[0024]** In examples, the condenser unit comprises a condenser, a compressor and an expansion valve.

**[0025]** In examples, the refrigerator further comprises a coupling configured for disconnecting the conduit from the evaporator within the refrigerated area.

**[0026]** In examples, the coupling is arranged on the evaporator.

**[0027]** In examples, the coupling is arranged between the evaporator and the conduit support.

**[0028]** In examples, the refrigerator is a back bar refrigerator appliance. A back bar refrigerator appliance is typically sized to fit within a cavity or recess behind a bar, for example under a worksurface and/or between opposing walls.

**[0029]** In examples, the recess has an open edge, such that the recess is an embayment of an edge of the separation wall. This is advantageous because the conduit support can be received in the recess by moving the conduit support in a direction parallel to the separation wall.

**[0030]** According to another aspect of the present invention, there is provided a conduit support for supporting a conduit that extends through a separation wall between a refrigerated area of a refrigerator and a condenser unit of the refrigerator, the conduit support comprising an opening for the conduit and the conduit support being shaped to engage a recess formed in the separation wall such that the conduit support can be separated from the separation wall for removal of the condenser unit from the refrigerator.

**[0031]** According to yet another aspect of the present invention, there is provided a condenser unit for a refrigerator, the condenser unit comprising a condenser, a conduit, and a conduit support.

**[0032]** According to another aspect of the present invention, there is provided a separation wall for a refrigerator, the refrigerator comprising a refrigerated area and a cabinet for housing a condenser unit, wherein the separation wall divides the refrigerated area and the cabinet, and wherein the separation wall comprises a recess shaped to receive a conduit support of the condenser unit such that the conduit support can be sepa-

rated from the separation wall for removal of the condenser unit from the refrigerator.

**[0033]** According to a further aspect of the present invention, there is provided a refrigerator comprising a refrigerated area and a cabinet and a separation wall.

### Brief Description of the Drawings

**[0034]** Embodiments of the invention are now described, by way of example only, hereinafter with reference to the accompanying drawings, in which:

**Figure 1** illustrates (a) a perspective view of a refrigerator with a conduit support separated from the separation wall for removal of the condenser unit, and (b) a close-up view of the conduit support and the recess in the separation wall;

**Figure 2** illustrates a perspective view of a conduit support partially removed from the recess of the separation wall;

**Figure 3** illustrates a perspective view of the conduit support of Figure 2, mounted onto a cover panel attached to a condenser unit;

**Figure 4** illustrates a perspective view of a conduit support, in an (a) exploded view from a first side, (b) exploded view from a second side, and (c) assembled view with a first support portion attached to a second support portion;

**Figure 5** illustrates an example of an insert for the separation wall (a) in a perspective view, and (b) in a profile front view;

**Figure 6** illustrates another example of an insert for the separation wall (a) in a perspective view, and (b) in a profile front view;

**Figure 7** illustrates an a conduit received in an opening of the conduit support;

**Figure 8** illustrates an assembly including the conduit and conduit support of Figure 7, received in an insert;

**Figure 9** illustrates a section view of a conduit support partially removed from the recess of the separation wall (a) showing fasteners extending from a planar surface of the conduit support, and (b) attached to a cover panel attached to a condenser unit via the fasteners; and

**Figure 10** illustrates a conduit support attached to a

cover panel attached to a condenser unit (a) in a perspective view, and (b) viewed from the top.

### Detailed Description

**[0035]** Certain terminology is used in the following description for convenience only and is not limiting. The words 'right', 'left', 'lower', 'upper', 'front', 'rear', 'upward', 'down' and 'downward' designate directions in the drawings to which reference is made and are with respect to the described component when assembled and mounted. The words 'inner', 'inwardly' and 'outer', 'outwardly' refer to directions toward and away from, respectively, a designated centreline or a geometric centre of an element being described (e.g. central axis), the particular meaning being readily apparent from the context of the description.

**[0036]** Further, as used herein, the terms 'connected', 'attached', 'coupled', 'mounted' are intended to include direct connections between two members without any other members interposed therebetween, as well as, indirect connections between members in which one or more other members are interposed therebetween. The terminology includes the words specifically mentioned above, derivatives thereof, and words of similar import.

**[0037]** Further, unless otherwise specified, the use of ordinal adjectives, such as, "first", "second", "third" etc. merely indicate that different instances of like objects are being referred to and are not intended to imply that the objects so described must be in a given sequence, either temporally, spatially, in ranking or in any other manner.

**[0038]** Like reference numerals are used to depict like features throughout.

**[0039]** Referring now to Figure 1, there is shown a refrigerator 500. The refrigerator 500 has a refrigerated area 511 and a cabinet 505, each located within a refrigerator housing 502. The refrigerated area 511 and the cabinet 505 are arranged on different sides of a separation wall 504, such that the separation wall 504 divides the refrigerated area 511 of the refrigerator 500 from the cabinet 505 of the refrigerator 500. The refrigerator 500 is provided with a refrigeration system having an evaporator disposed within the refrigerated area 511, and a condenser unit 512 disposed within the cabinet 505. The refrigerator 500 is provided with an expansion valve and a compressor 510 coupled to the condenser coils of the condenser unit 512. The condenser unit 512 has a support housing. The refrigerator 500 has a front surface, and a door 513 arranged on the front surface in front of the refrigerated area 511. The cabinet 505 is arranged adjacent the door 513 of the refrigerator 500.

**[0040]** As shown in Figure 1(b), the refrigerator 500 has a conduit 90 and a conduit support 10 through which the conduit 90 extends and connects to an evaporator (not shown) in the refrigerated area 511. In use, conduit support 10 is received in a recess 71 within the separation wall 504 such that the conduit 90 is received in the conduit

support 10 and extends through the separation wall 504 of the refrigerator 500 in a sideways direction. In this example, the conduit support 10 and the recess 71 are configured in a front-to-back arrangement so that the conduit support 10 can be removed from the recess 71 of the separation wall 504 in a forwards direction. This allows the conduit support 10, and the conduit 90 received in conduit support 10, to be receivable within and removable from the separation wall 504 so that the condenser unit 512 can be removed from the refrigerator cabinet 505. In this example, the removal of the condenser unit 512 from the cabinet 505 is in a forwards direction parallel to the separation wall 504. The recess 71 has an open edge, such that the recess 71 is an embayment of an edge of the separation wall 504. In this example, the conduit support 10 is mounted onto a cover panel 508 so that the removal of the cover panel 508 detaches the conduit support 10 from the recess 71. The cover panel 508 also hides the conduit support 10 from view. In this example, a coupling (not shown) is provided such that the conduit 90 can be disconnected from the evaporator to detach the condenser unit 512 from the rest of the refrigerator 500. It is envisaged that the coupling can be arranged on the evaporator or between the evaporator and the conduit support 10.

**[0041]** Figure 2 shows the conduit support 10 partially removed from the recess 71 of the separation wall 504. In this example, the separation wall 504 has a first wall panel 504a on the side of the refrigerated area 511 and a second wall panel 504b on the side of the cabinet 505. In this example, the recess 71 is provided in the separation wall 504 by an insert 70. An insulation panel 507 is provided under the insert 70 between the first wall panel 504a and the second wall panel 504b so help prevent heat transfer between the refrigerated area 511 of the refrigerator 500 and the cabinet 505. The conduit support 10 is provided with an opening (58, Figure 4(C)) through which the conduit 90 extends from the condenser coils of the condenser unit 512 to the evaporator provided within the refrigerated area 511. In this example, the conduit support 10 receives a mounting plate 50 through which fasteners 56 extend out of the conduit support 10 at the front. An exterior surface of the conduit support 10 includes a ridge 18 that is shaped and sized to be received within a groove 74 provided in the recess 71. The ridge 18 of the conduit support 10 slots within the groove 74 of the recess 71 when the conduit support 10 is received in the recess 71. The cooperation of the ridge 18 and groove 74 seals the conduit support 10 against the recess 71 of the separation wall 504. The ridge 18 provides a negative draft, resulting in an air tight fit with the groove 74. It is envisaged that the conduit support 10 may thermally insulate the conduit 90. The conduit support 10 is shaped to prevent heat loss in the conduit 90.

**[0042]** As shown in Figure 3, the fasteners 56 protrude out of the conduit support 10 towards the front of the conduit support 10 to attach to a cover panel 508. The

connection of the conduit support 10 to the cover panel 508 is also shown in Figures 9 and 10. When the conduit support 10 is attached to the cover panel 508 in this way, the removal of the cover panel 508 from the refrigerator 500 causes the conduit support 10 to detach from the recess 71 of the separation wall 504. The conduit support 10 has an exterior surface facing the recess 71 with a generally semi-cylindrical shape. The recess 71 also has a semi-cylindrical shape, having a receiving surface 506 shaped to receive the conduit support 10.

**[0043]** Figure 4 shows the conduit support 10. The conduit support 10 includes a first support portion 12 that is releasably attached to a second support portion 32 using fasteners 22,48. In particular, the fastener 22 is received in an aperture 20 on the first support portion 12 and into an aperture 40 on the second support portion 32, securing one side of the first and second support portions 12,32. The fastener 48 is received in an aperture 46 on the second support portion 32 and into an aperture 30 on the first support portion 12, securing the other side of the first and second support portions 12,32. The first support portion 12 has semi-cylindrical conduit receiving portion 14 with a conduit receiving surface 16. The second support portion 32 has a semi-cylindrical conduit receiving portion 34 with a conduit receiving surface 36. The first and second conduit receiving portions 14,34 together define an opening 58 for receiving the conduit 90.

**[0044]** In this example, the conduit support 10 has a ridge 18 on its exterior surface, provided by ridge portions 18,38 of the respective first support portion 12 and the second support portion 32. Also in this example, the conduit support 10 is provided with a cavity formed by respective cavity portions 28,42 in the first support portion 12 and the second support portion 32. The cavity 28 is sized and shaped to receive a mounting plate 50 that is used to attach the conduit support 10 to the cover panel 508 of the condenser unit 512. When received in the cavity 28, the front surface of the mounting plate 50 is flush against the front planar surface of the conduit support 10. The mounting plate 50 is held in place by inserting a fastener 26 through an aperture 24 provided on the ridge portion 18 on the first support portion 12, through an aperture 52 provided at the top of the mounting plate 50 and into an aperture 44 provided through the ridge portion 38 of the second support portion 32. The mounting plate 50 is provided with two apertures 54 through which fasteners 56 are inserted towards the front direction so that the conduit support 10 can be attached to a part of the condenser unit 512, for example the cover panel 508.

**[0045]** Figure 5 shows the insert 70 for placement within the separation wall 504. The insert 70 is substantially semi-cylindrically shaped. The insert 70 is provided with a recess 71, which in this example has a semi-cylindrical shape. The recess 71 has a groove 74 that terminates at a first end 80 and a second end 82. The groove 74 provides a deeper recessed surface for increased engagement within the conduit support 10. Figure 6 shows another example of an insert 70 that is made

of a foam material, which in this example is polyethylene. It is envisaged that other foam materials can be used, for example polyurethane or polystyrene. It is envisaged that the insert 70 may be made of an insulating foam material. The insert 70 may dampen vibrations of the conduit 90 during use. The insert 70 may thermally insulate the conduit 90.

**[0046]** As shown in Figure 7, conduit support 10 has an opening through which the conduit 90 extends. In this example, tubular foam insulation parts 92 is provided at the ends of the conduit support 10 around the conduit 90 to provide additional insulation for the conduit 90. Figure 8 further shows an insert 70 receiving the conduit support 10. In particular, the ridge 18 provided on the exterior surface of the conduit support is received in the groove 74 of the insert 70, holding the conduit support 10 in place.

**[0047]** Referring now to Figure 9 and Figure 10, the insert 70 is provided in the separation wall 504 such that a recess 71 is formed to receive the conduit support 10. The conduit support 10 can therefore be received within and removed from the recess 71 in the separation wall 504. The conduit support 10 is attached to a cover panel 508 of the condenser unit 512 so that the conduit support 10, the conduit 90 held within the conduit support, and the cabinet unit 512 may be removed from the cabinet 505 in a forwards direction away from the recess 71. This provides improved access to the condenser unit 512 for servicing the refrigerator 500 because the separation wall 504 does not obstruct the conduit 90 from being removed.

**[0048]** It will be appreciated by persons skilled in the art that the above detailed examples have been described by way of example only and not in any limitative sense, and that various alterations and modifications are possible without departing from the scope of the invention as defined by the appended claims. Various modifications to the detailed examples described above are possible.

**[0049]** Through the description and claims of this specification, the words "comprise" and "contain" and variations of them mean "including but not limited to", and they are not intended to (and do not) exclude other moieties, additives, components, integers or steps. Throughout the description and claims of this specification, the singular encompasses the plural unless the context otherwise requires. In particular, where the indefinite article is used, the specification is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

**[0050]** Features, integers, characteristics, compounds, chemical moieties or groups described in conjunction with a particular aspect, embodiment or example of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith. All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least

some of such features and/or steps are mutually exclusive. The invention is not restricted to the details of any foregoing embodiments. The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract or drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

**[0051]** It will be appreciated by persons skilled in the art that the above embodiment(s) have been described by way of example only and not in any limitative sense, and that various alterations and modifications are possible without departing from the scope of the invention as defined by the appended claims. Various modifications to the detailed designs as described above are possible.

**Claims**

- 1. A refrigerator, comprising:
  - a refrigerated area and a cabinet;
  - a separation wall dividing the refrigerated area and the cabinet;
  - a refrigeration system comprising an evaporator disposed in the refrigerated area, a condenser unit disposed in the cabinet and a conduit connecting the condenser unit with the evaporator, wherein the conduit extends through the separation wall; and
  - a conduit support having an opening through which the conduit extends, wherein the separation wall comprises a recess shaped to receive the conduit support such that the conduit support can be separated from the separation wall for removal of the condenser unit from the cabinet.
  
- 2. A refrigerator according to claim 1, wherein the condenser unit is removable from the cabinet in a removal direction, wherein the separation wall is parallel to the removal direction and the conduit extends perpendicularly to the separation wall, optionally wherein the refrigerator has a front surface, wherein the refrigerated area has a door on the front surface, wherein the cabinet is located to a side of the refrigerated area and the condenser unit is removable from the front surface of the refrigerator.
  
- 3. A refrigerator according to claim 1 or claim 2, wherein the separation wall comprises a first wall panel proximal the refrigerated area and a second wall panel proximal the cabinet, optionally wherein the separation wall comprises insulation between the first wall panel and the second wall panel, and further optionally wherein the recess is arranged between the first wall panel and the second wall panel.

- 4. A refrigerator according to any one of the preceding claims, wherein an outer surface of the conduit support comprises a ridge.
  
- 5. A refrigerator according to any one of the preceding claims, wherein the conduit support comprises a first support portion releasably attached to a second support portion, optionally wherein the first support portion comprises a first portion of the ridge and the second support portion comprises a second portion of the ridge, and further optionally wherein the recess comprises a groove sized and shaped to receive the ridge of the conduit support, and further optionally wherein the groove and the ridge are configured to form a seal when the ridge is received in the groove.
  
- 6. A refrigerator according to claim 5, wherein the first support portion defines a first conduit engaging surface and the second support portion defines a second conduit engaging surface, the first and second conduit engaging surfaces together defining the opening.
  
- 7. A refrigerator according to any one of the preceding claims, wherein the conduit support is configured to seal against the recess and the conduit.
  
- 8. A refrigerator according to any one of the preceding claims, wherein the conduit support comprises a cavity for receiving a mounting plate for attaching the conduit support to the condenser unit, optionally wherein the first support portion and the second support portion each define a portion of the cavity.
  
- 9. A refrigerator according to any one of the preceding claims, wherein a portion of the outer surface of the conduit support comprises a planar surface, optionally wherein the planar surface is arranged flush with the mounting plate when the mounting plate is received in the cavity.
  
- 10. A refrigerator according to any one of the preceding claims, wherein the condenser unit comprises a condenser, a compressor and an expansion valve.
  
- 11. A refrigerator according to any one of the preceding claims, further comprising a coupling configured for disconnecting the conduit from the evaporator within the refrigerated area, optionally wherein:
  - the coupling is arranged on the evaporator, or
  - the coupling is arranged between the evaporator and the conduit support.
  
- 12. A conduit support for supporting a conduit that extends through a separation wall between a refrigerated area of a refrigerator and a condenser unit of the refrigerator, the conduit support comprising an open-

ing for the conduit and the conduit support being shaped to engage a recess formed in the separation wall such that the conduit support can be separated from the separation wall for removal of the condenser unit from the refrigerator.

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**13.** A condenser unit for a refrigerator, the condenser unit comprising a condenser, a conduit, and a conduit support according to claim 12.

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**14.** A separation wall for a refrigerator, the refrigerator comprising a refrigerated area and a cabinet for housing a condenser unit, wherein the separation wall divides the refrigerated area and the cabinet, and wherein the separation wall comprises a recess shaped to receive a conduit support of the condenser unit such that the conduit support can be separated from the separation wall for removal of the condenser unit from the refrigerator.

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**15.** A refrigerator comprising a refrigerated area and a cabinet and the separation wall according to claim 14.

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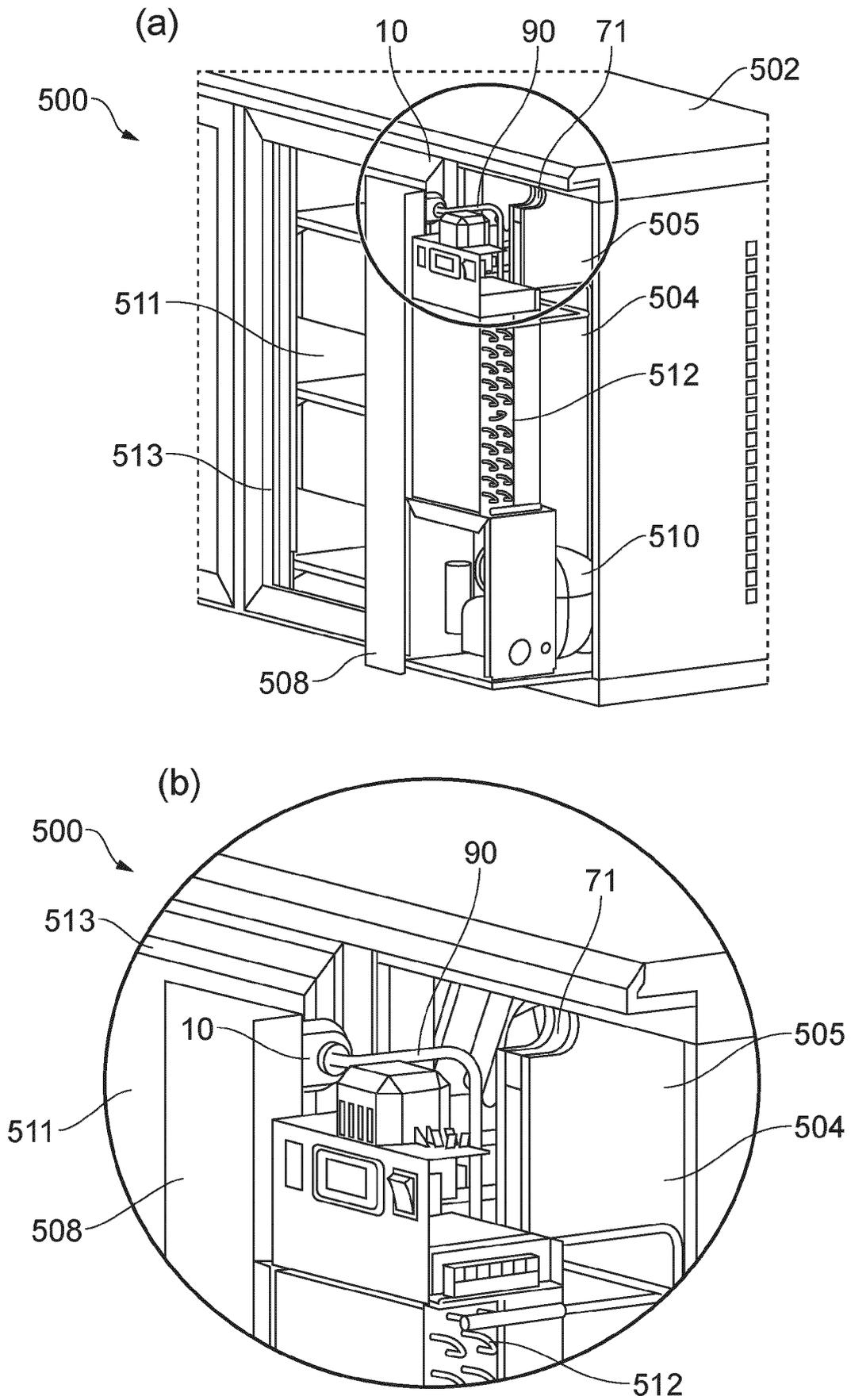


FIG. 1

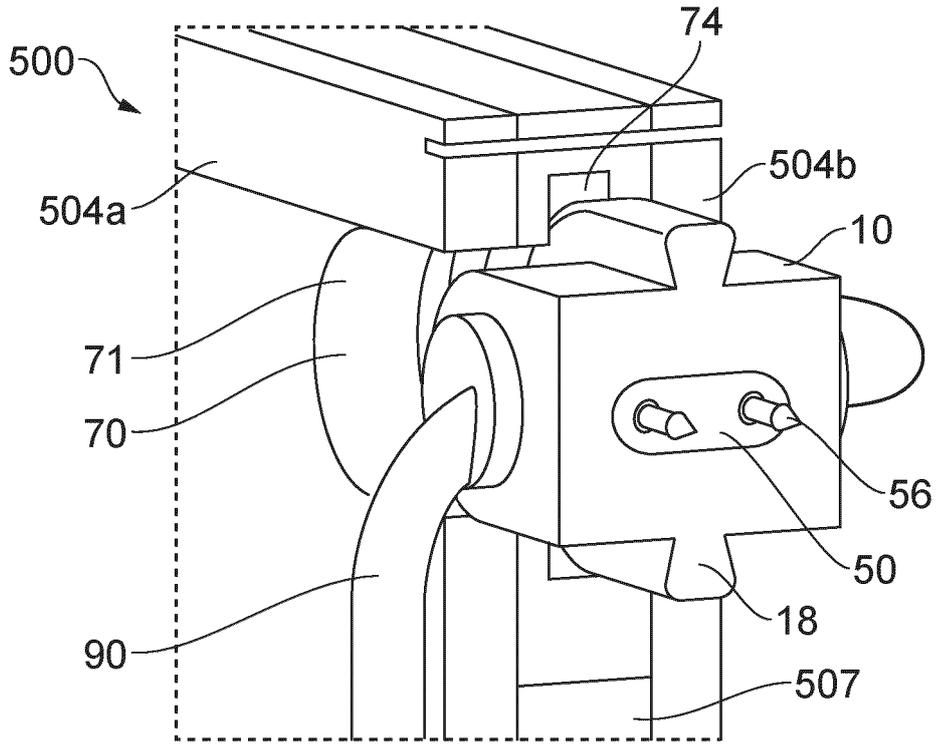


FIG. 2

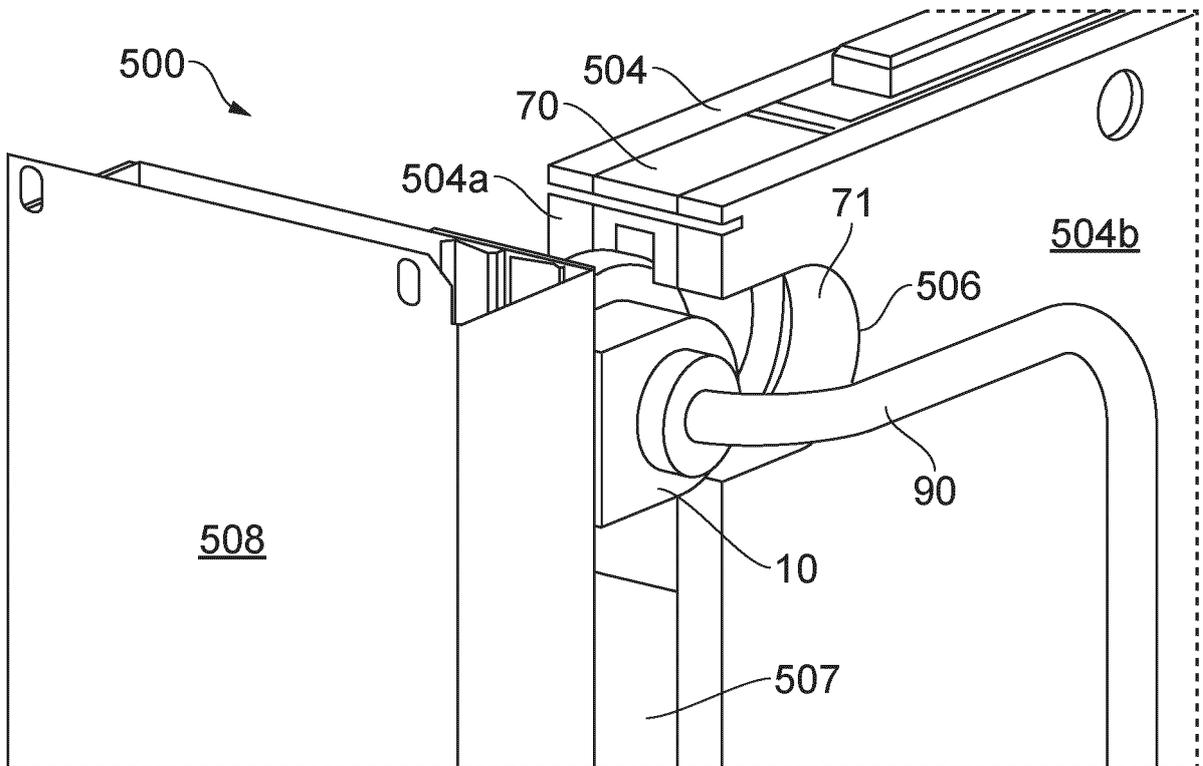


FIG. 3

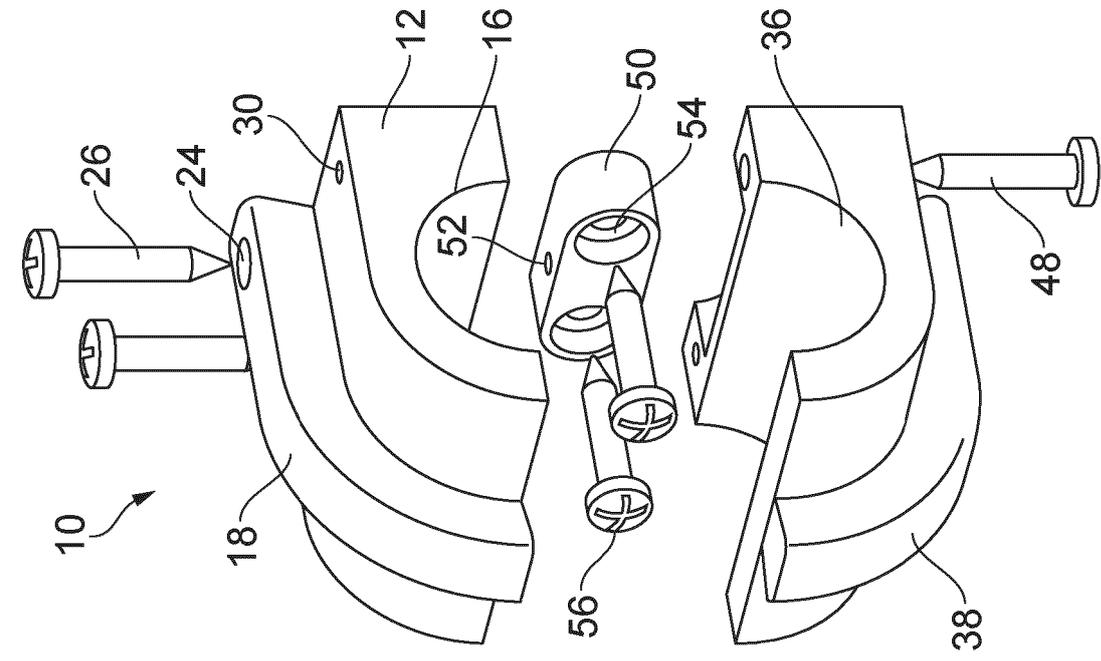


FIG. 4(b)

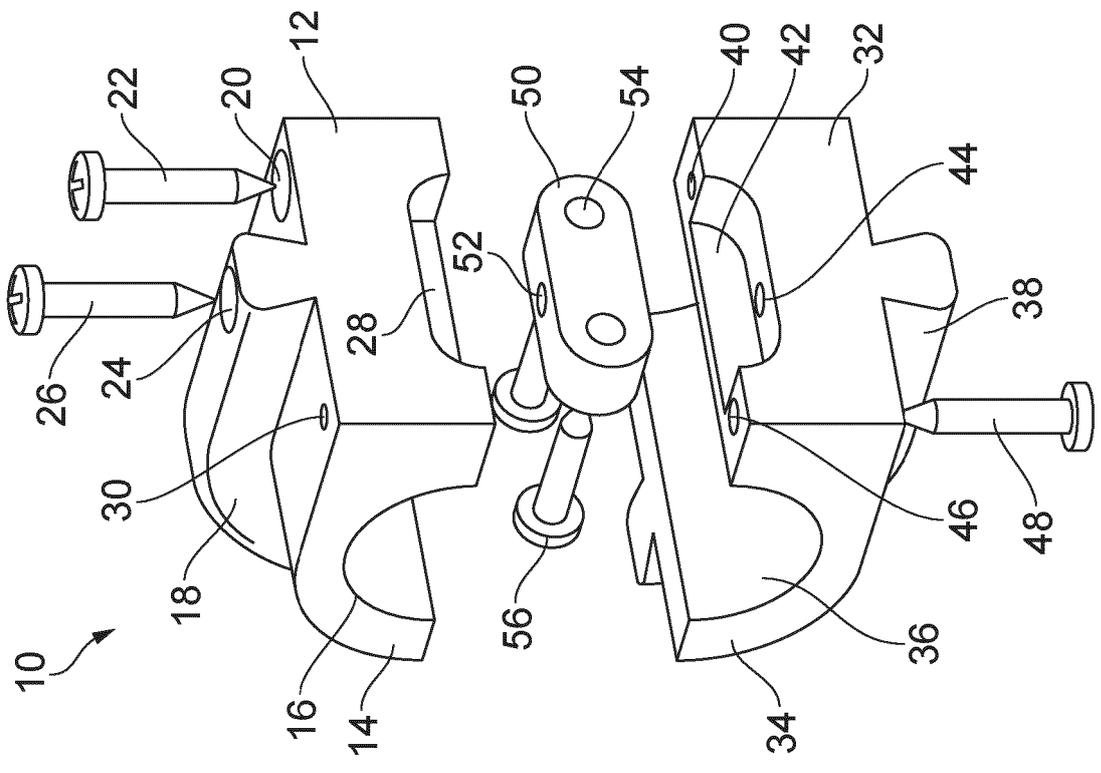


FIG. 4(a)

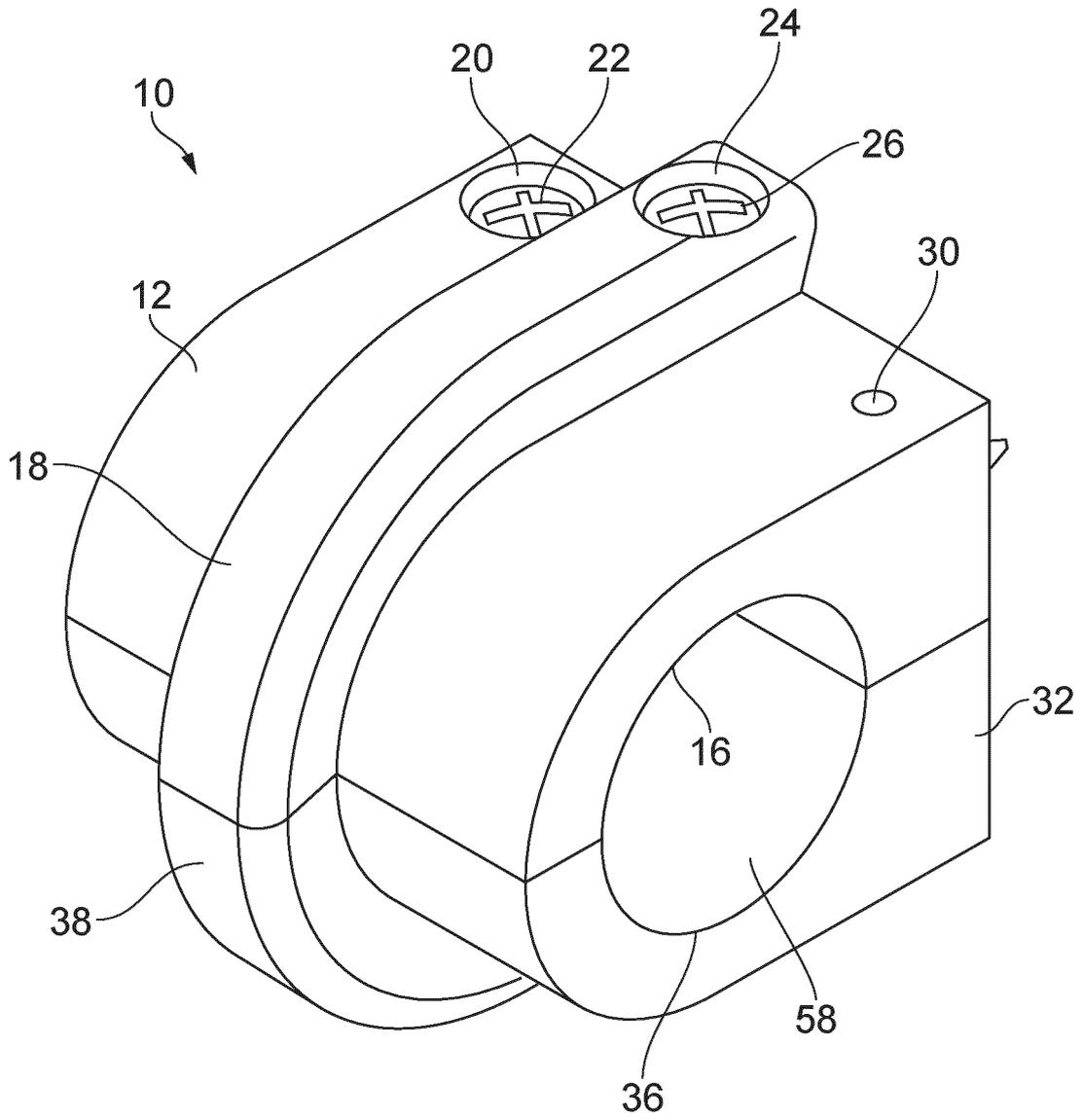


FIG. 4(c)

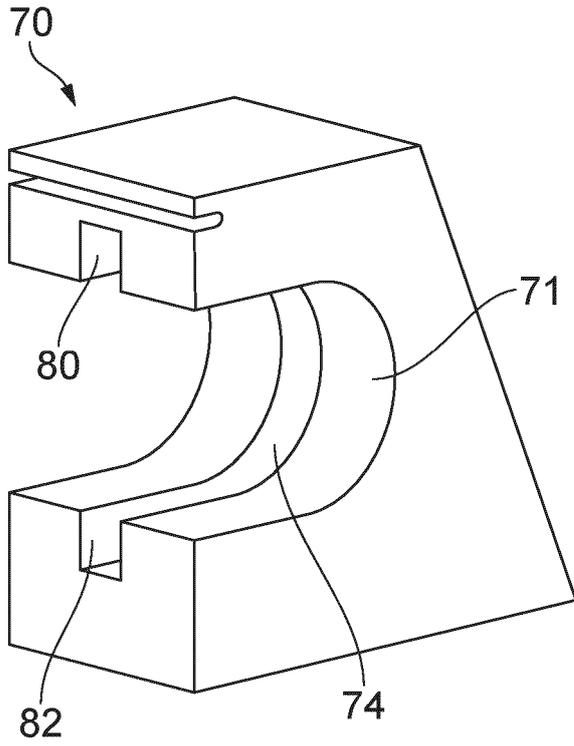


FIG. 5(a)

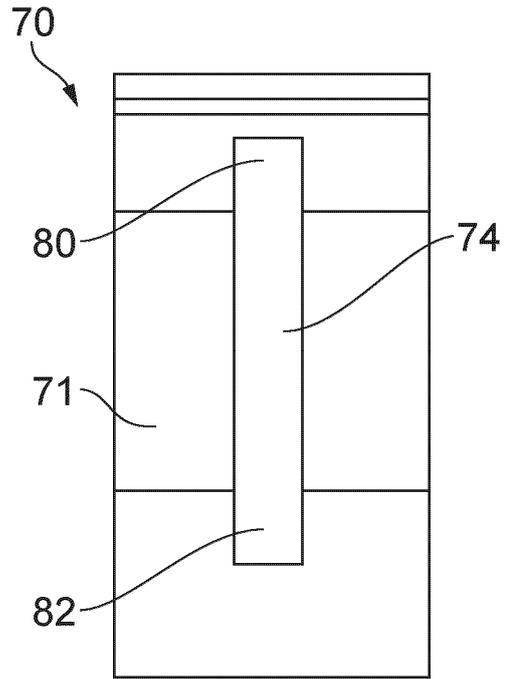


FIG. 5(b)

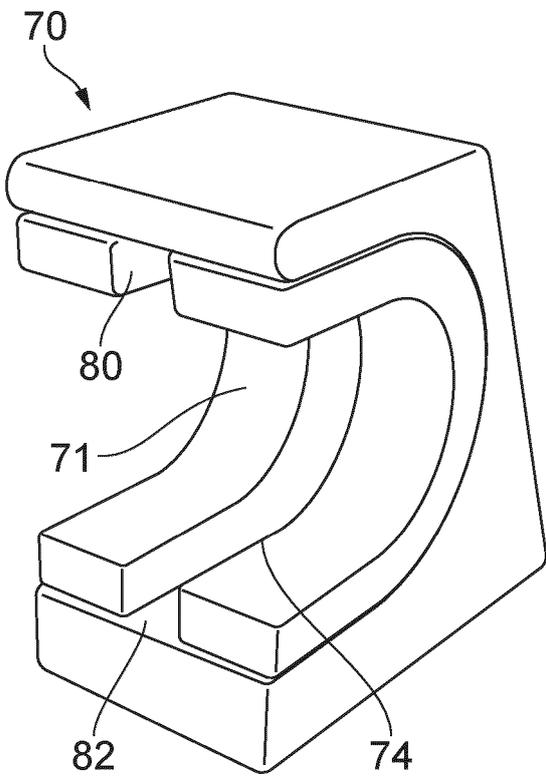


FIG. 6(a)

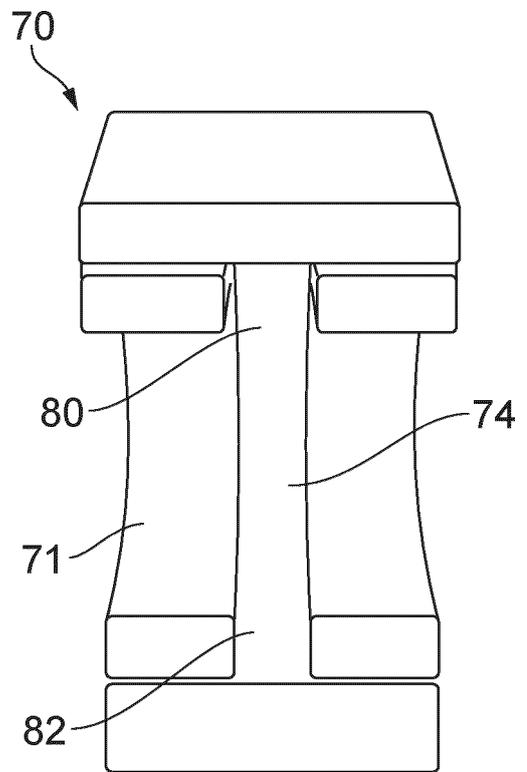


FIG. 6(b)

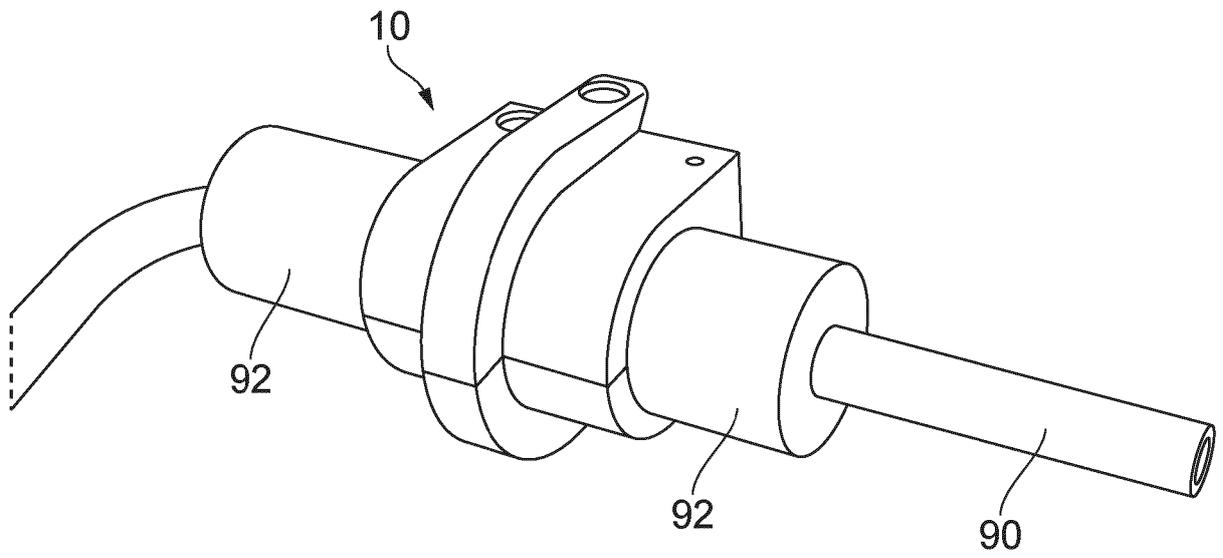


FIG. 7

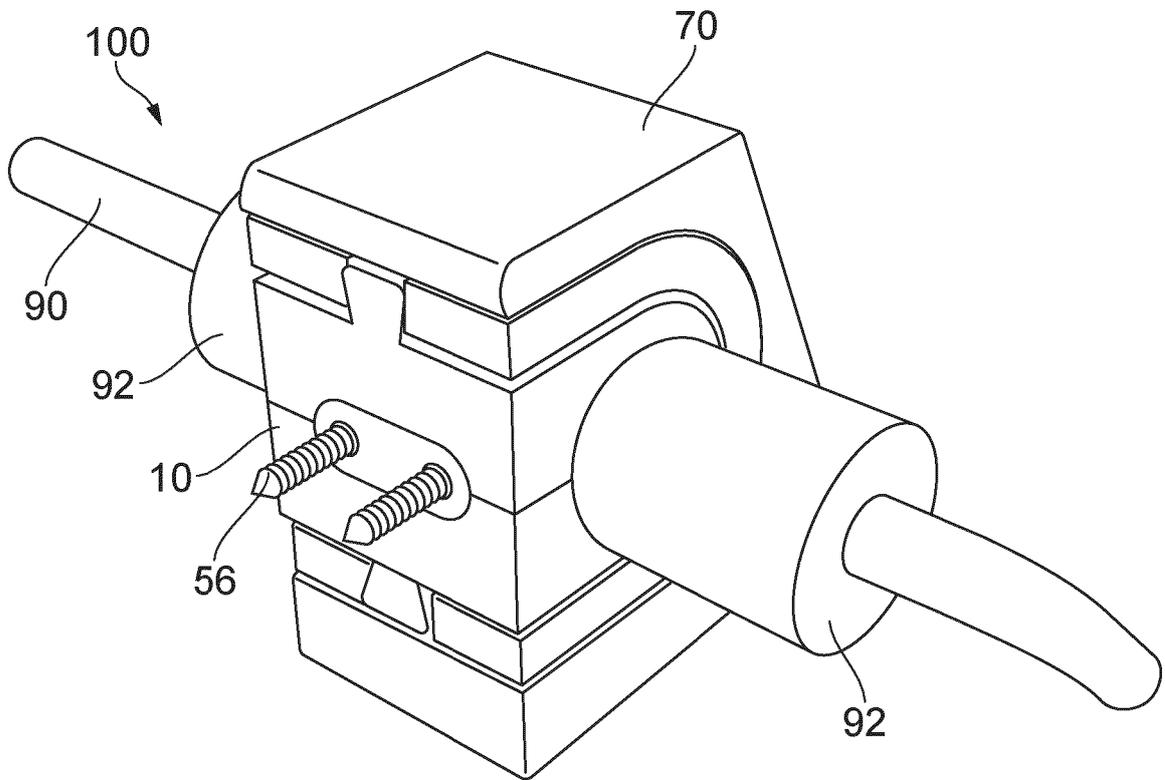


FIG. 8

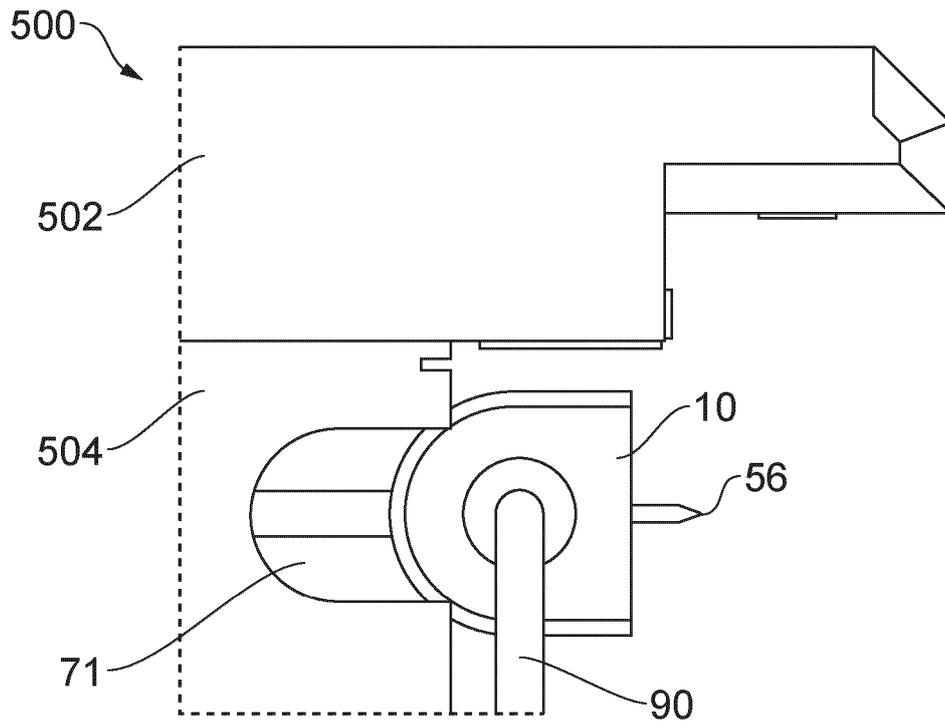


FIG. 9(a)

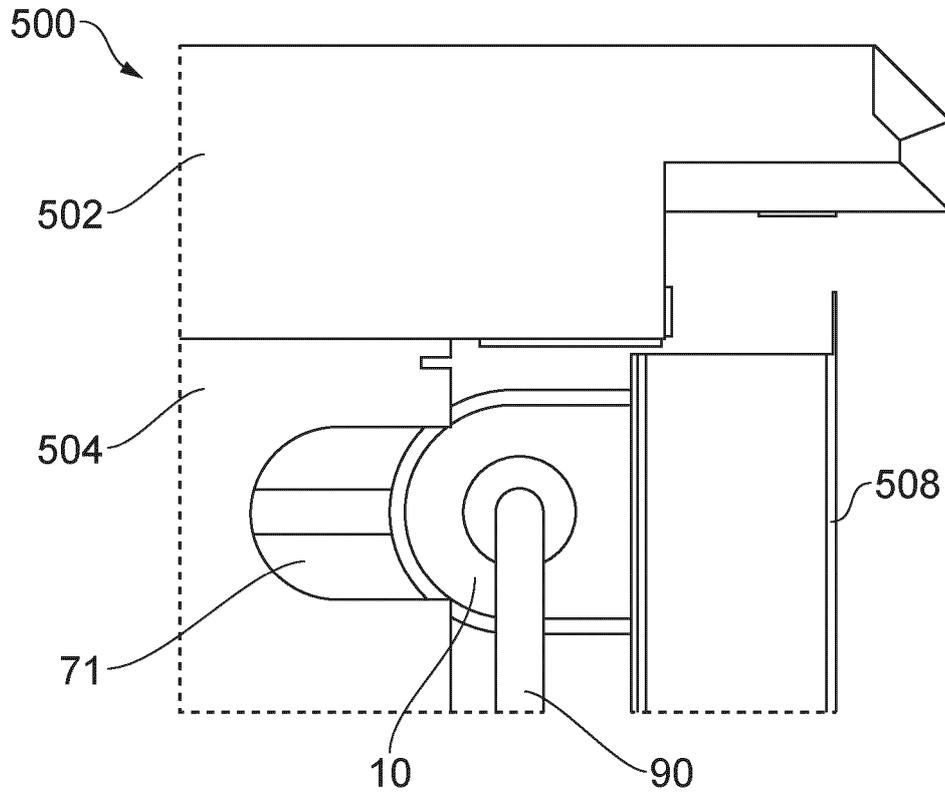


FIG. 9(b)

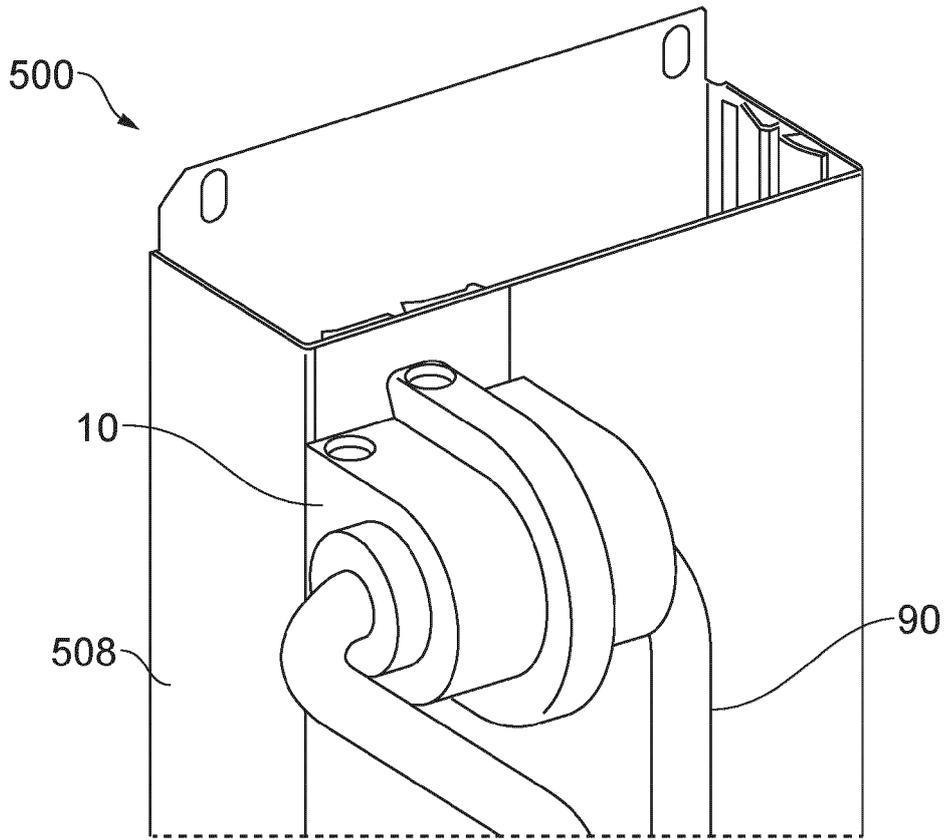


FIG. 10(a)

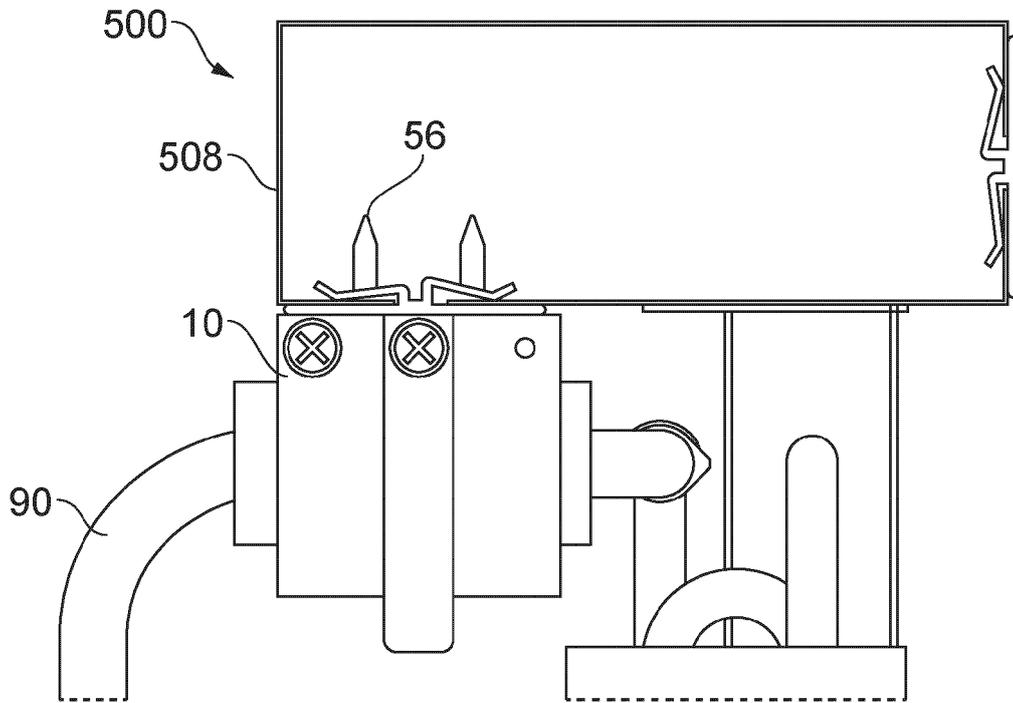


FIG. 10(b)



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