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(54) **MODULAR EQUIPMENT CASE**

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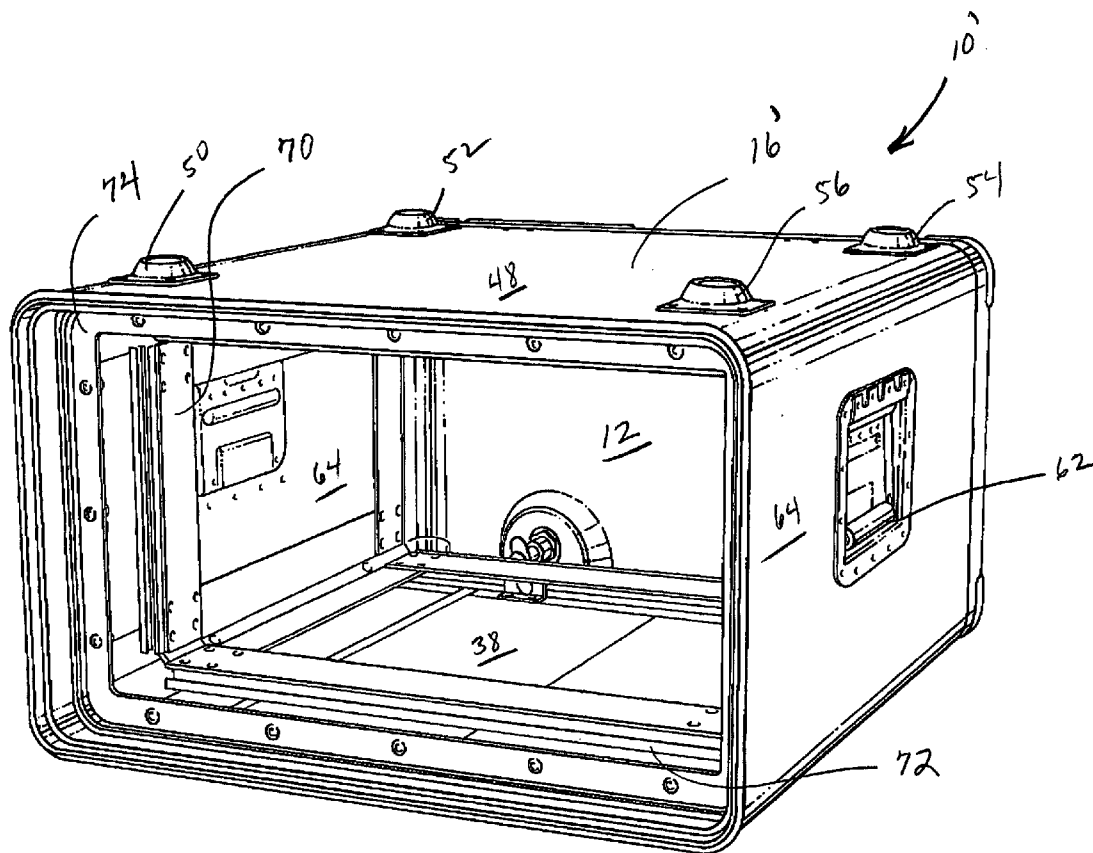
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(57) **ABSTRACT**

The invention is a rack mounted equipment case (10) for use in harsh environmental conditions. The case has a reduced-height front lid (12) and a full-height back lid (14), each of which is easy to remove via latches, which facilitates access to the contents within the case. A connector panel (30) is recessed below the front lid (14). In situations where the case is used to house electronics, the electrical connections can remain in place via the connector panel while the front or back lid is removed for maintenance or other purposes. Shielding can also be simply accommodated.

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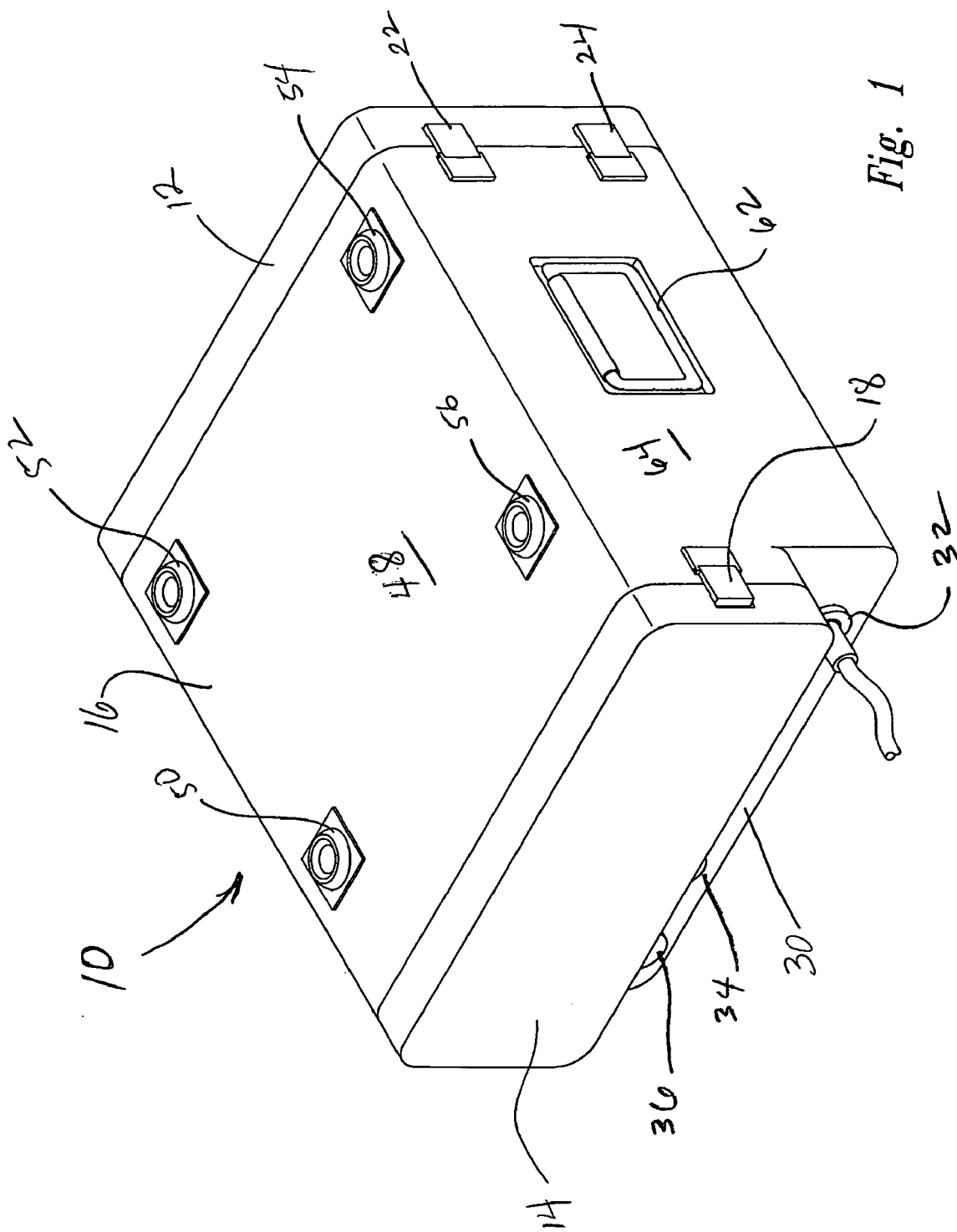


Fig. 1

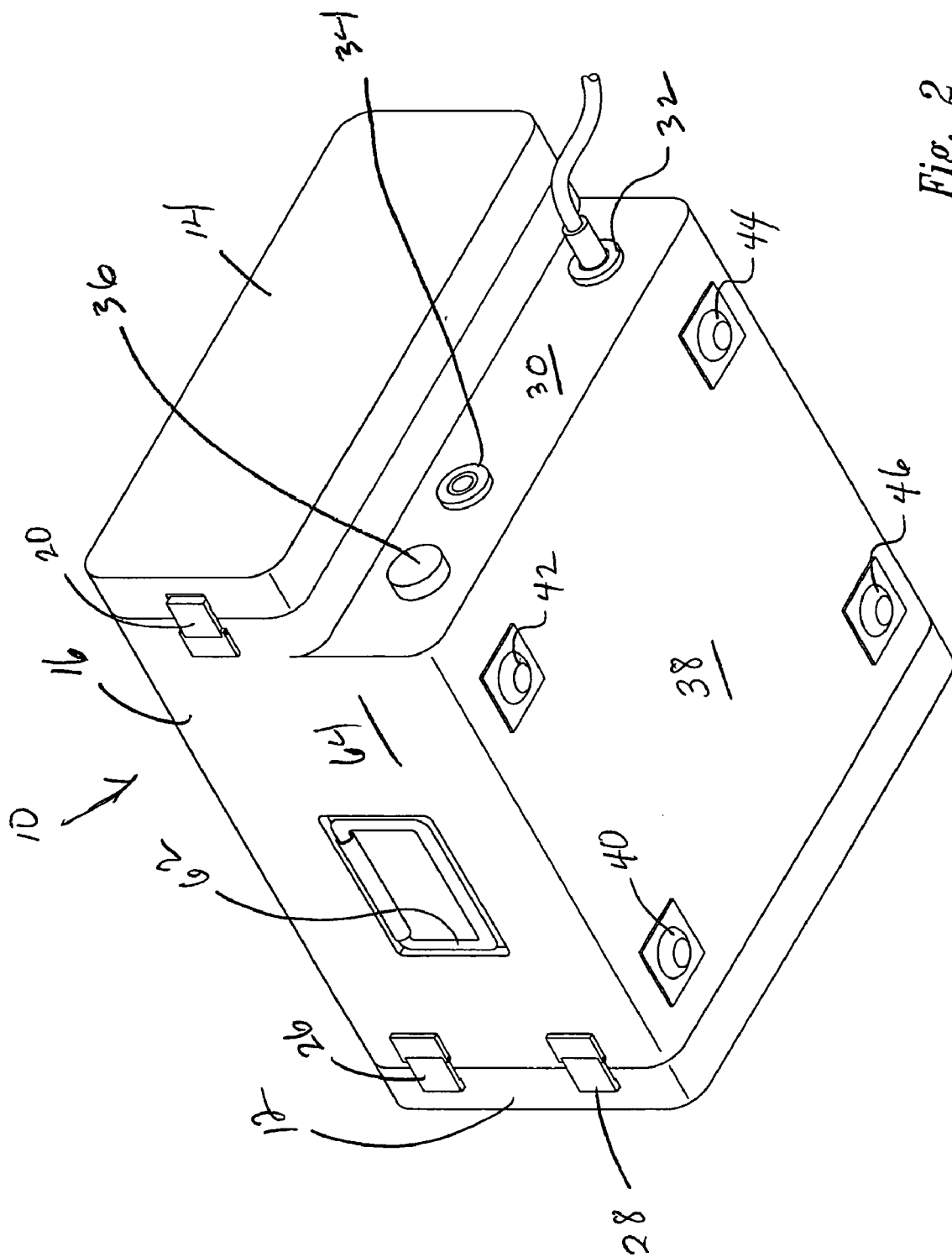


Fig. 2

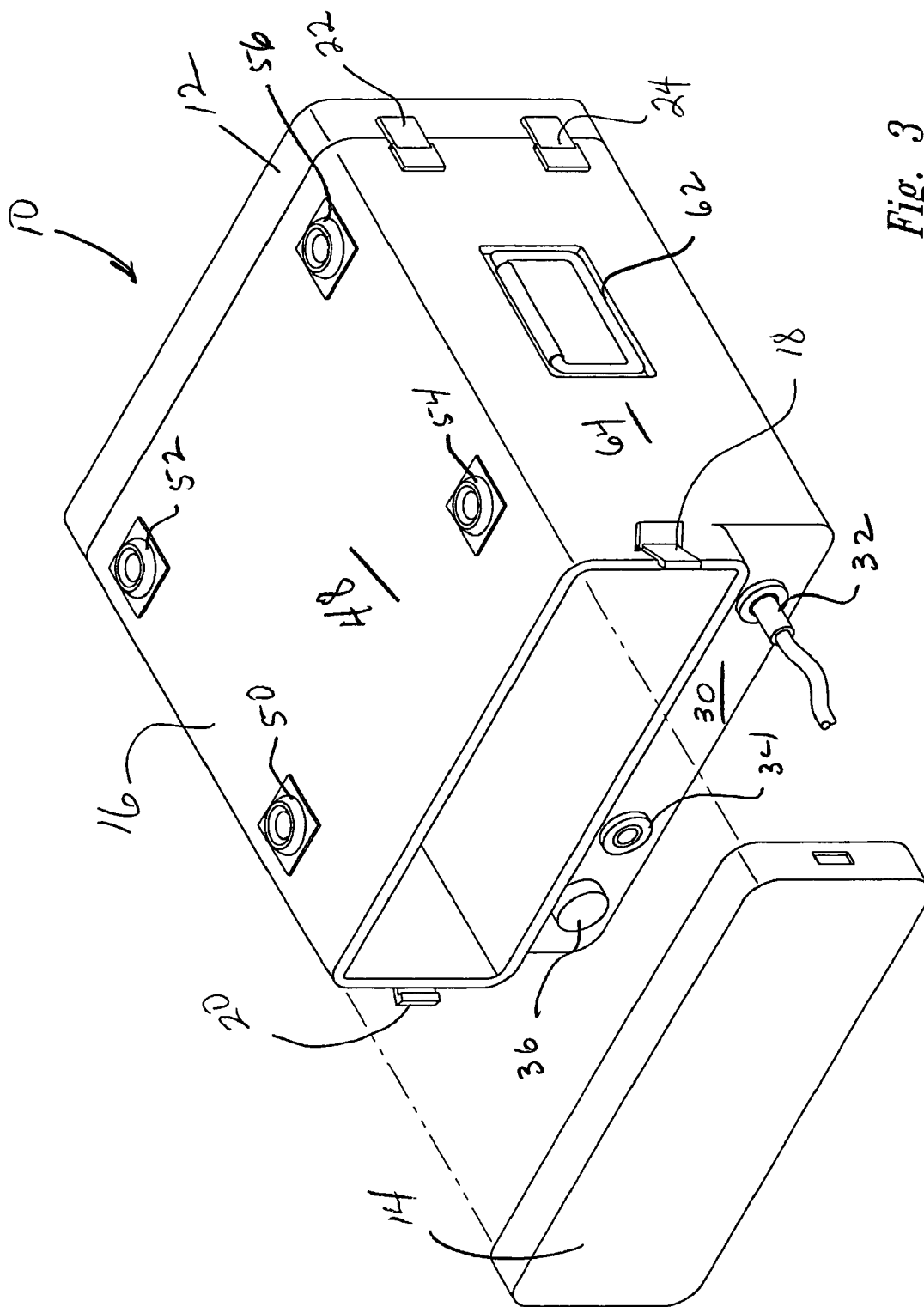


Fig. 3

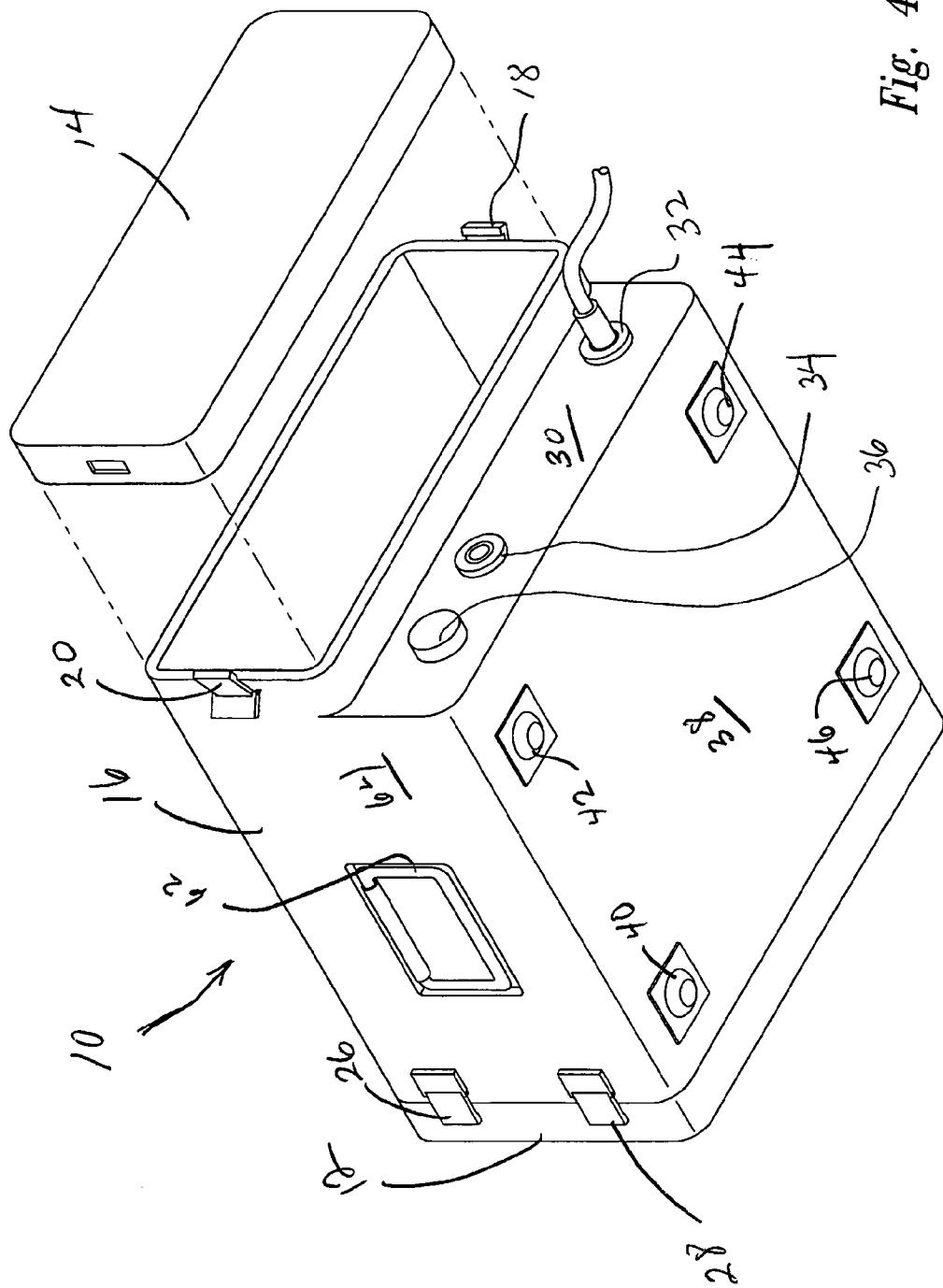


Fig. 4

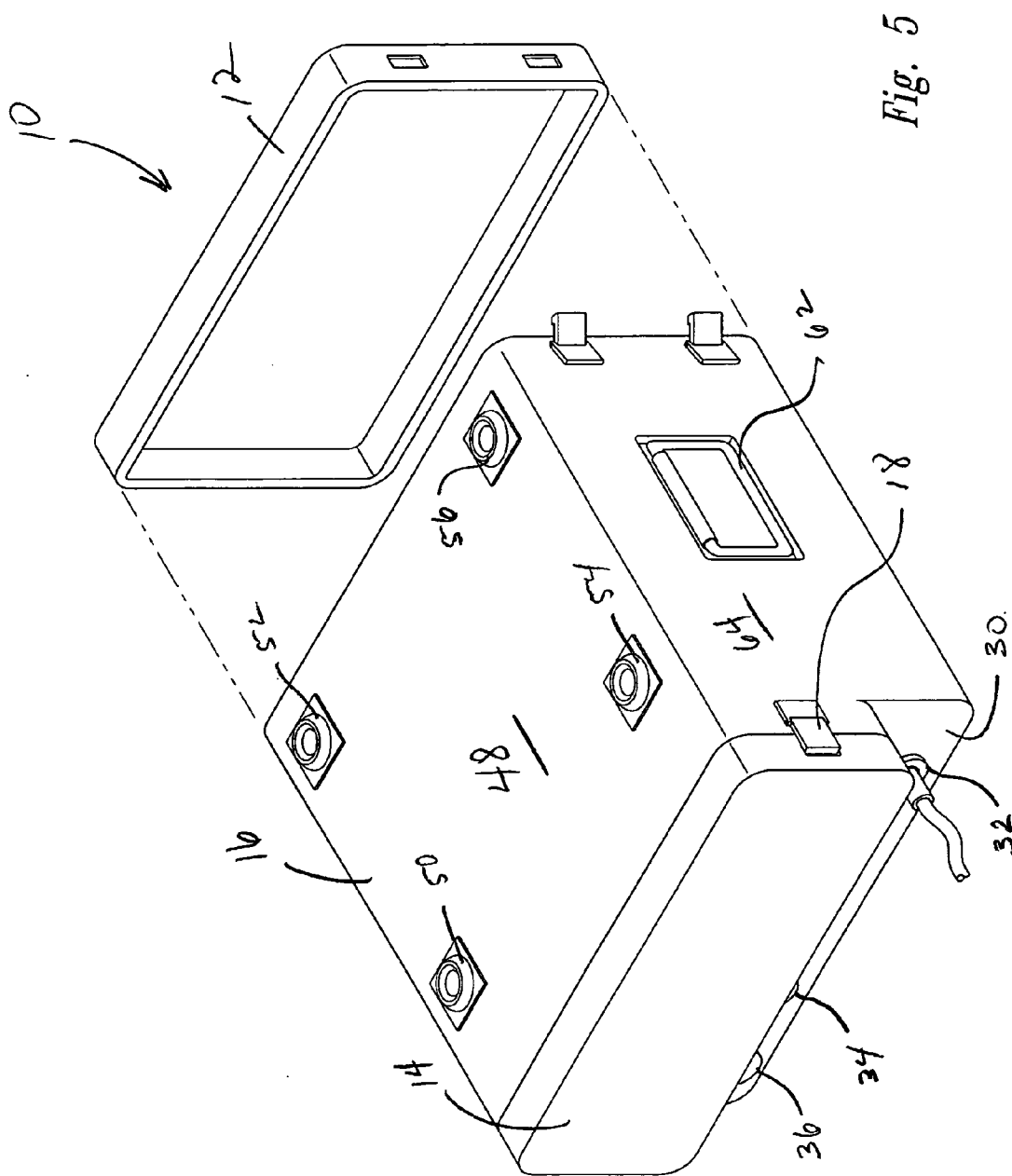


Fig. 5

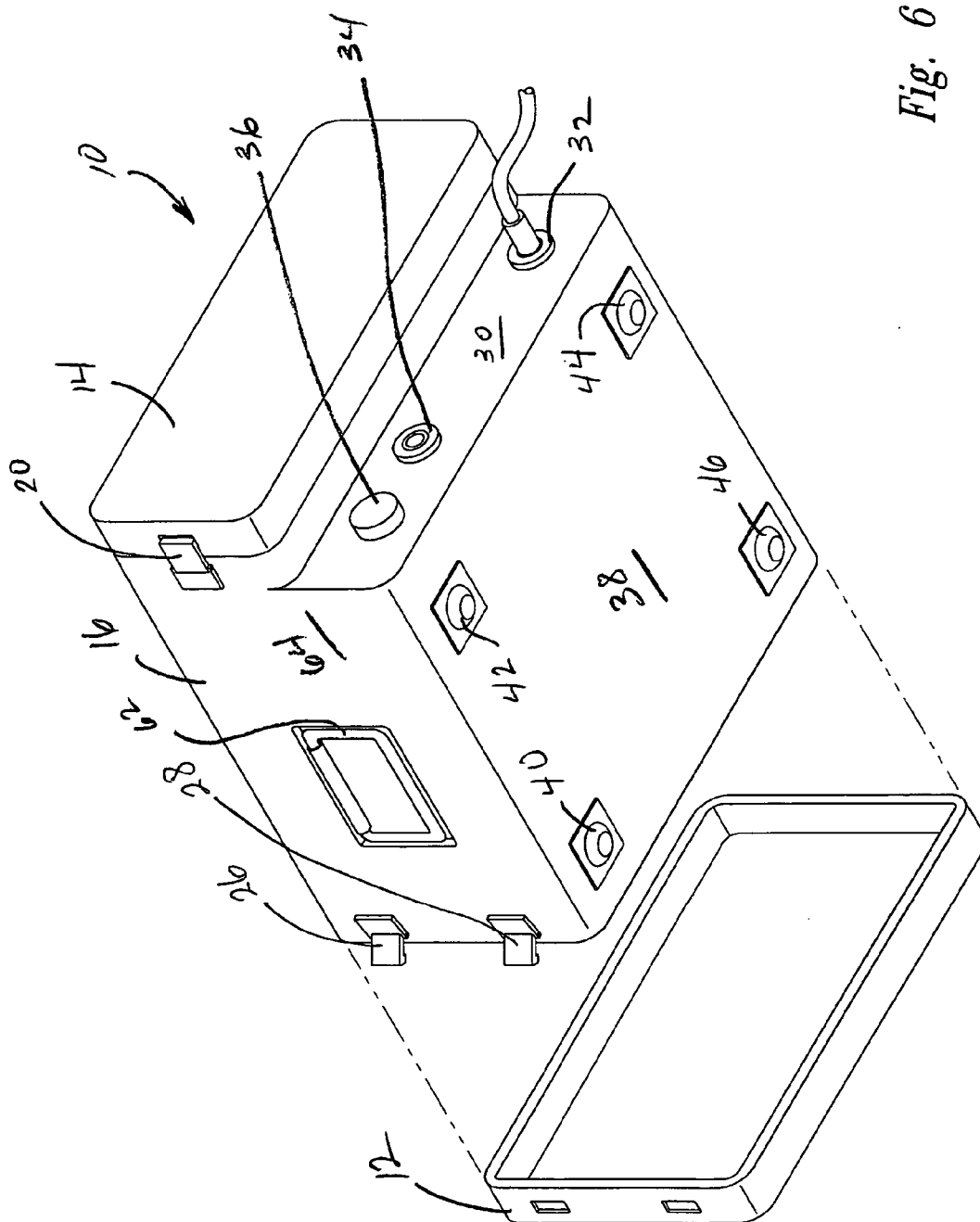


Fig. 6

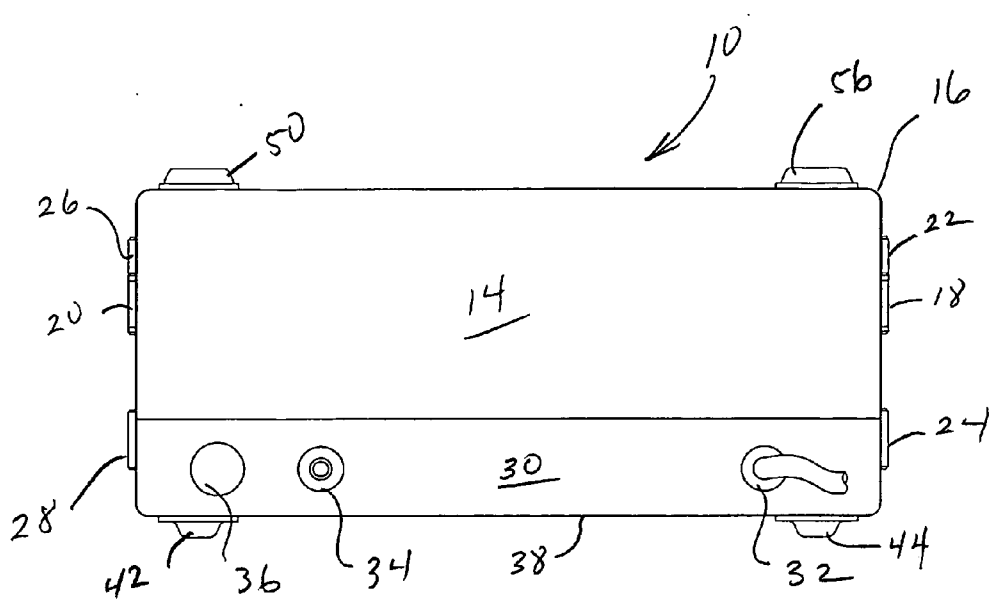


Fig. 7

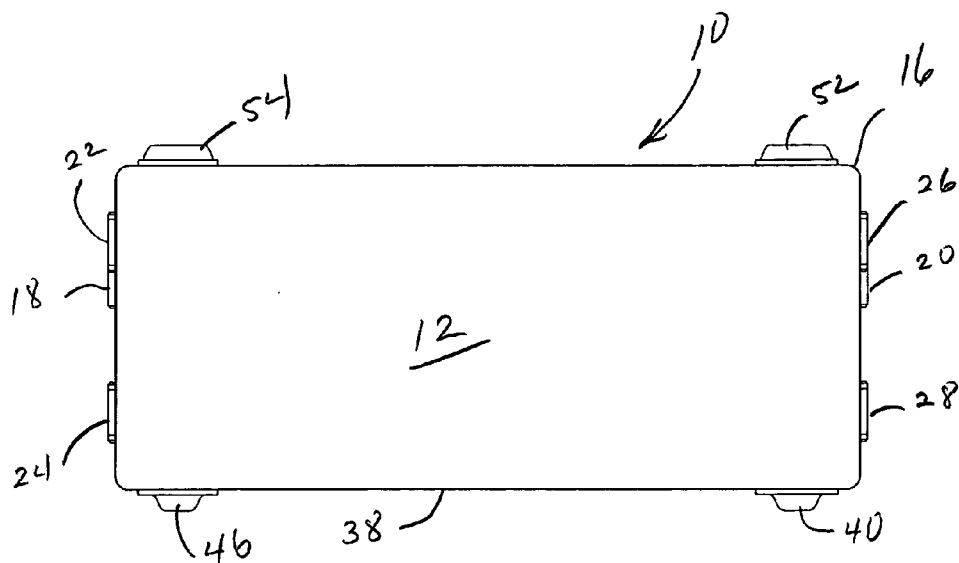


Fig. 8

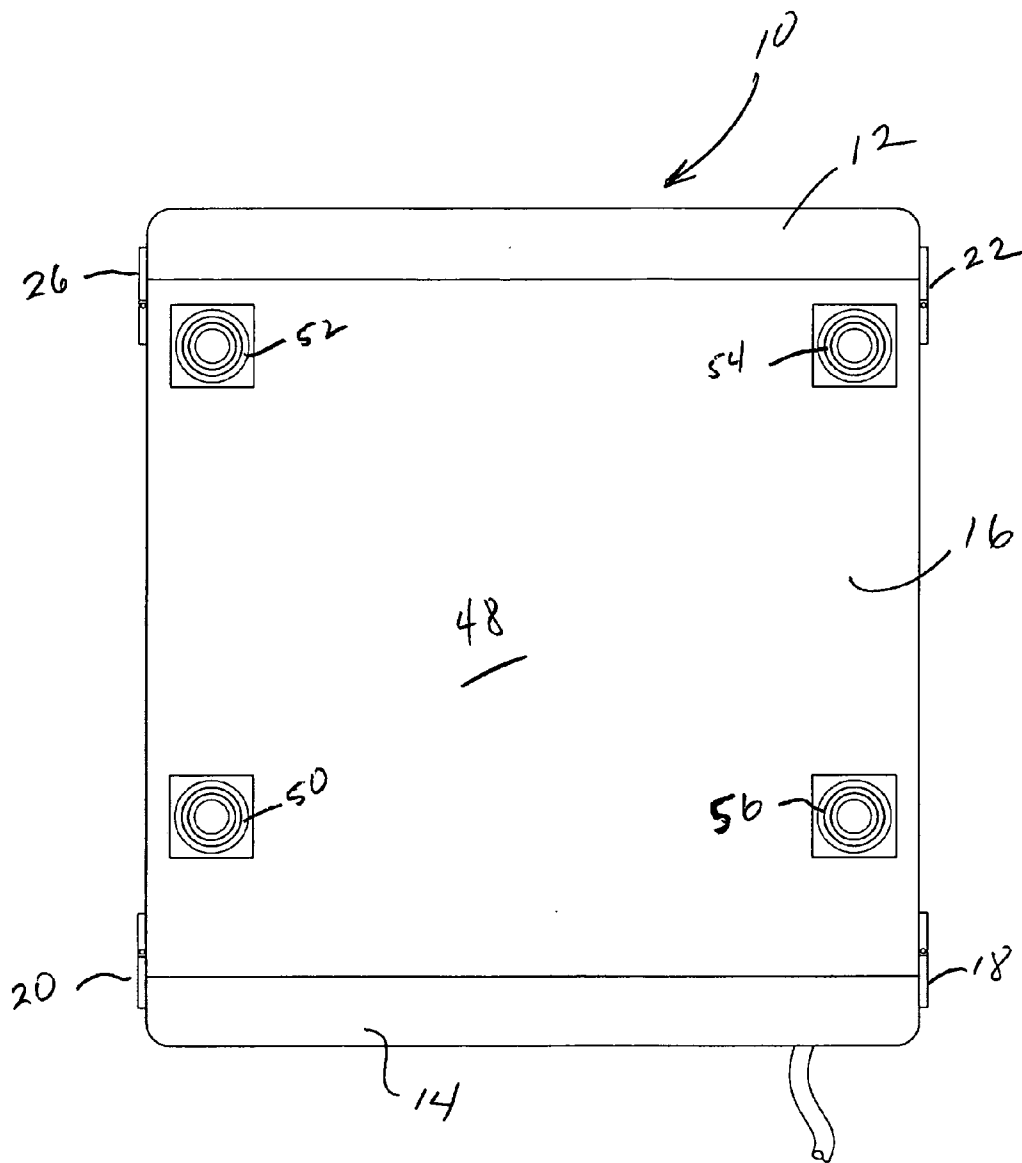


Fig. 9

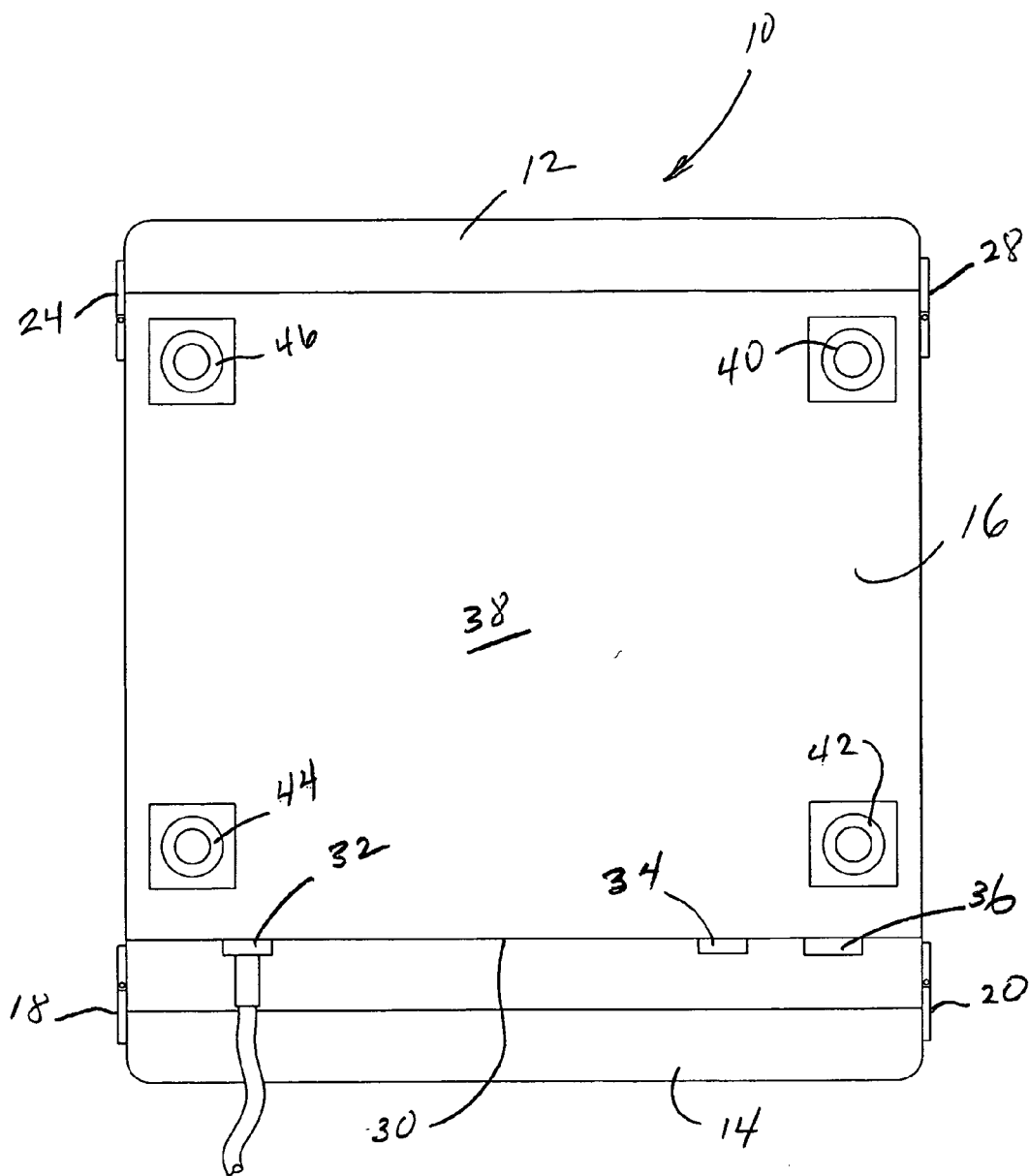


Fig. 10

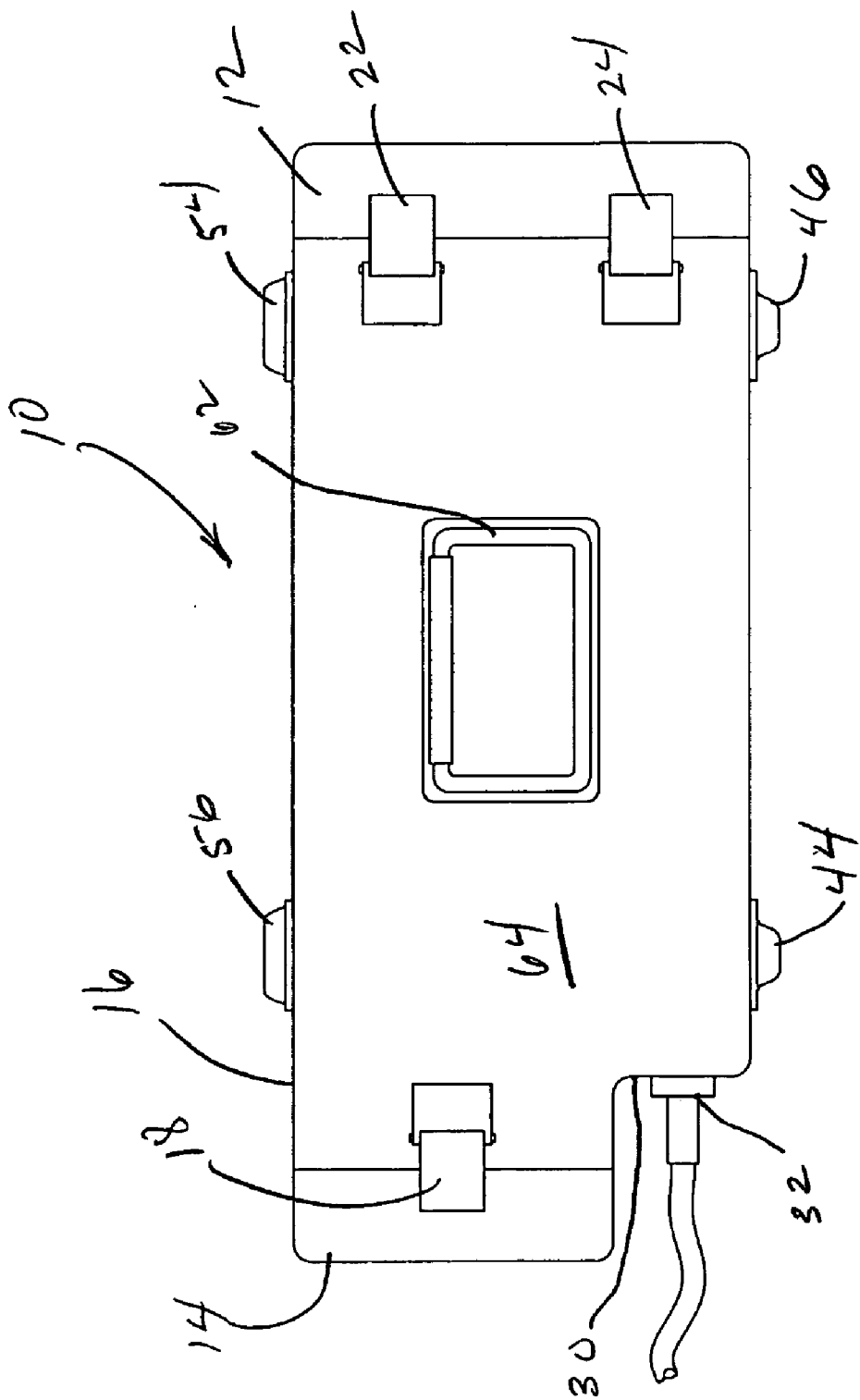


Fig. 11

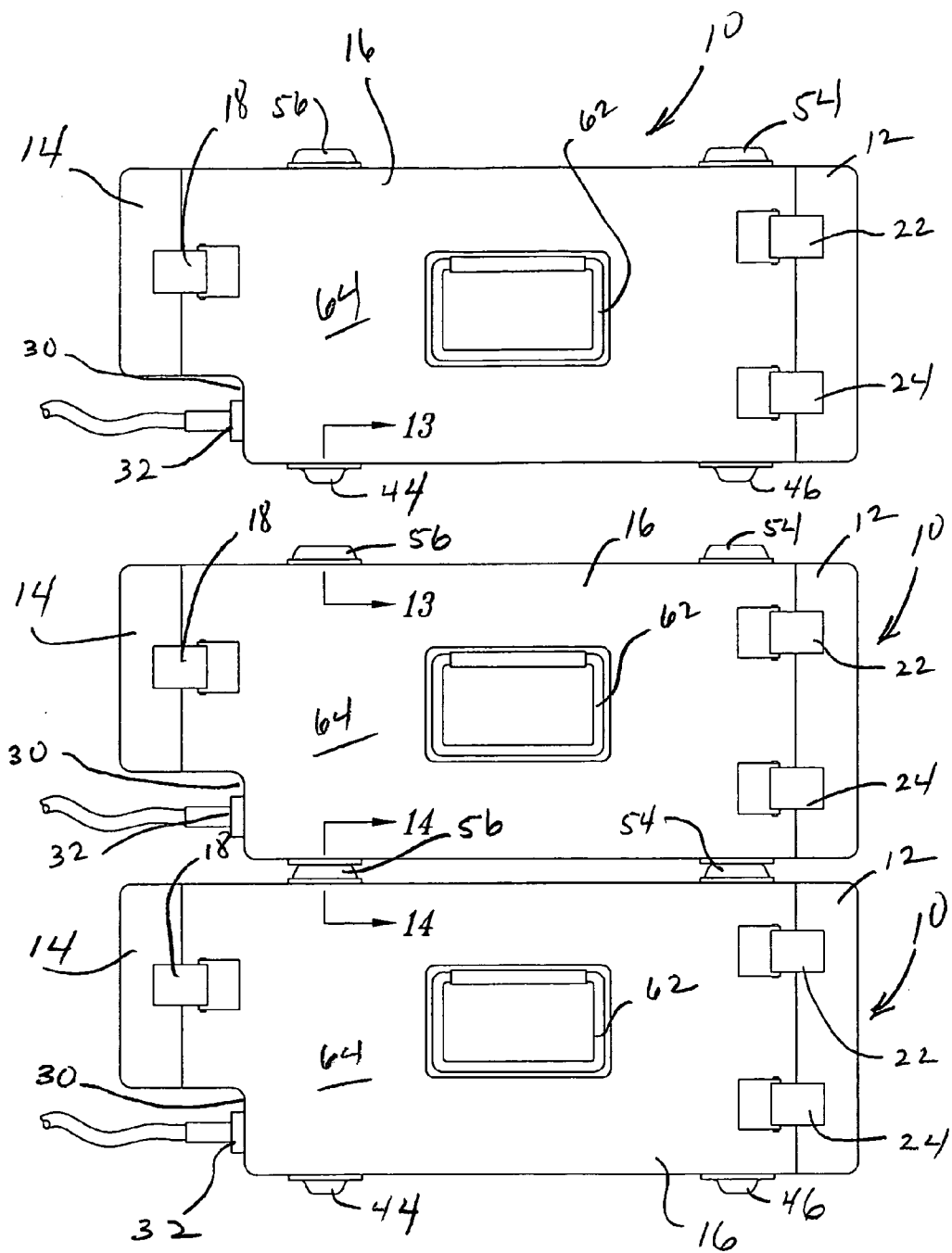


Fig. 12

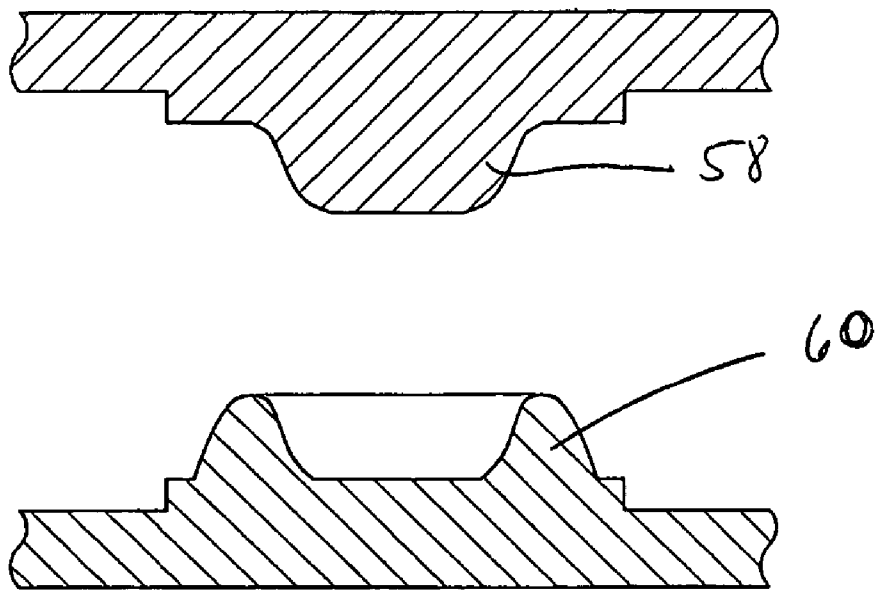


Fig. 13

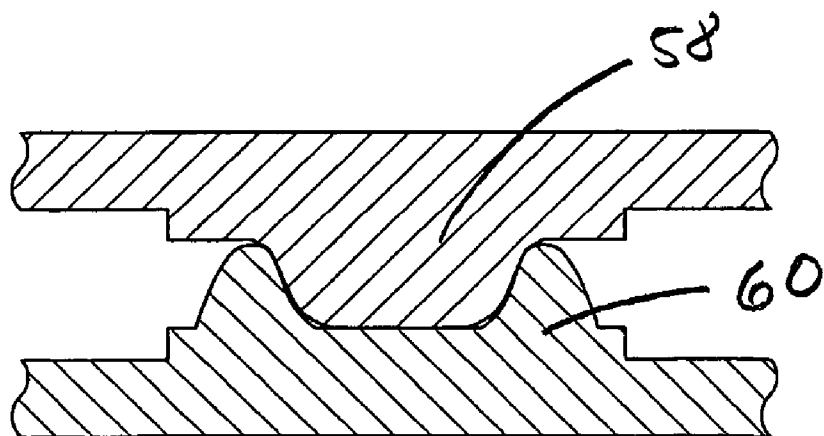


Fig. 14

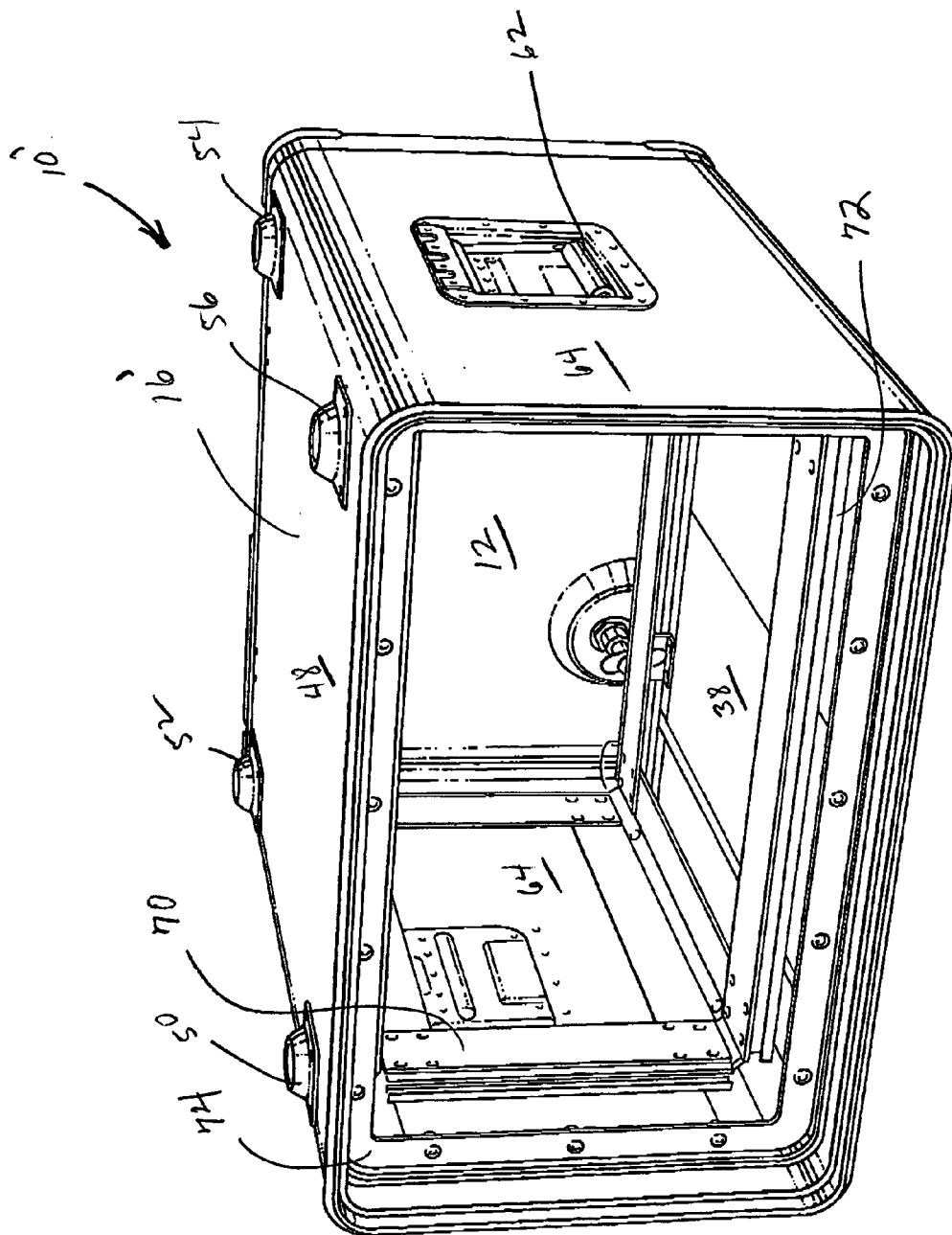


Fig. 15

MODULAR EQUIPMENT CASE**TECHNICAL FIELD**

[0001] The invention disclosed here relates to rack mounted equipment cases.

BACKGROUND OF THE INVENTION

[0002] There is a type of metal case used in industrial applications that is called a rack mounted equipment case used for accommodating rack-mount electronics, which is made to standard or other sizes—typically 19 inch (approx 46 cm) but clearly the cases can be designed for any size. Rack mounted equipment cases are typically made from aluminum but may be made from other materials. They usually have a body tube that has a rectangular cross section closed at each end by removable covers. This shape makes them amenable to stacking in racks or stacking one on top of another. While these cases have many applications and uses, it is not uncommon to use them as transportable, protective housings for electronic components in harsh environmental conditions where the components are subjected to strong mechanical shocks, vibration or inclement weather.

[0003] In certain applications, rack mounted equipment cases are used to network electronics in one case with another or to a broader network. In these particular applications, the rack mounted equipment case often has a connector panel from which various kinds of cable and other electrical connectors or fittings protrude. The connector panel is usually attached to the case by small bolts or screws in a manner so that it can be removed in order to access internal components. However, since the connector fittings are also located on the panel, it is necessary to disconnect corresponding cables and wiring before the panel can be opened. What this means is that use of the electronics inside the case is either lost or shut down during a maintenance or other operation.

[0004] The invention relates to rack mounted equipment cases that house electronic components for use in electronics, industrial, military or related applications where it is necessary to protect interior components from extreme environmental conditions, shock and vibration. It is normally necessary for the case to be sealed.

[0005] It is also a problem to provide electromagnetic (EMI/RFI) shielding to protect the internal electronics in the case from being disrupted by external sources whilst protecting external electronics from being disrupted from the internal items.

[0006] Because the cases may be used in vehicles, the case must provide a high degree of shock protection and be suitable for allowing the use of the equipment during transport. If the electronics are operational while in the sealed and shielded environment of the case, access to the interior of the case is essential for maintenance, inspection or other purposes and it is not acceptable to disconnect connectors to enable such access.

[0007] The connector panel also needs to be protected from knocks that may dislodge the connectors and for health and safety reasons to protect employees working in the vicinity. In many applications the space and weight allowance available for the rack mounted equipment cases may be limited.

SUMMARY OF THE INVENTION

[0008] The invention disclosed and described here is an improved rack mounted equipment case that provides a solution to the technical problems discussed above. In particular, it enables access to and maintenance of electronics within the case without necessarily shutting them down or disconnecting them from other components. A case that is constructed in accordance with the invention is also well-suited for stacking, because the connector fittings do not protrude outwardly relative to the outermost envelope occupied by the case when it sits in a rack or against a wall. There is normally a space and consequently weight saving. Finally, the rack case design disclosed here provides rapid and easy access to components inside the case for maintenance purposes.

[0009] In accordance with the invention there is provided a rack mounted equipment case comprising a body tube having two ends, a connector panel secured to the body tube at a first end, and a removable lid at at least one end, wherein a surface of the connector panel is recessed relative to an outer profile of the case.

[0010] Preferably the rack mounted equipment case has a reduced-height, removable lid on the first end, and the connector panel surface is recessed relative to the reduced-height lid.

[0011] The connector panel surface is protected below the reduced-height lid and provides an area for permanent placement of cable connectors, switches and similar fittings.

[0012] The reduced-height lid can be removed easily for allowing access to the interior of the case without disconnecting the fittings. Therefore, in some instances it is possible to undertake maintenance operations while interior electronic components continue to operate.

[0013] In an alternative configuration, the connector panel is secured inwardly of and closes the first end. Such a case could have just one removable lid or cover at the other end.

[0014] Rack mounted equipment cases in accordance with the invention protect the cables and connectors and makes it much simpler to shield and seal the contents of the case when a cover or lid is not there. These case configurations save space and weight.

[0015] The lids may be connected to the cases by a plurality of straps or latches. Depending on the size of the case, a pair of latches, one on each side, is used to connect the reduced-height lid to the case. Two or more pairs of latches may be used to connect the full-height lid on the other end of the case.

[0016] In order to facilitate stable stacking of one case on another, each case preferably has a plurality of feet, located on a bottom panel of the body tube typically near a corner of the case. A plurality of feet locators are similarly positioned on a top panel of the body tube of the case. The feet and feet locators are shaped to nest with each other and are arranged in an identical pattern so that one case can be stacked on top of another in a stable manner.

[0017] These various features are described in greater detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] In order that the invention may be well understood two embodiments thereof will now be described, by way of

example only, with reference to the accompanying diagrammatic drawings. In the drawings, like reference numerals and letters refer to like parts throughout the various views, and wherein:

[0019] **FIG. 1** is a pictorial view of a rack mounted equipment case constructed in accordance with a first embodiment of the invention;

[0020] **FIG. 2** is a view like **FIG. 1**, but is taken from a position underneath the case;

[0021] **FIG. 3** is view like **FIG. 1**, but shows the reduced-height lid removed from the case;

[0022] **FIG. 4** is a view like **FIG. 3**, but is taken from below the case;

[0023] **FIG. 5** is another pictorial view that shows the full-height lid removed from the case;

[0024] **FIG. 6** is a view like **FIG. 5**, but is taken from below the case;

[0025] **FIG. 7** is a view of the reduced-height end of the case;

[0026] **FIG. 8** is a view of the full-height end of the case;

[0027] **FIG. 9** is a top view of the case;

[0028] **FIG. 10** is a bottom view of the case;

[0029] **FIG. 11** is a side view of the case;

[0030] **FIG. 12** illustrates a plurality of cases stacked one on top of another;

[0031] **FIG. 13** is a cross-sectional view showing a case foot about to be nested within a foot locator;

[0032] **FIG. 14** is a view like **FIG. 13**, but shows the foot nested within the foot locator; and

[0033] **FIG. 15** shows a perspective view of a second embodiment of a rack mounted equipment case.

BEST MODE FOR CARRYING OUT THE INVENTION

[0034] Referring now to the drawings, and first to **FIG. 1**, shown generally at **10** is a rack mounted equipment case constructed in accordance with an exemplary embodiment of the invention. The case **10** can be made from aluminum, plastics, composites or other materials via a variety of manufacturing techniques. The size of the case **10** may vary depending on the intended application. However, these factors are not considered to be germane to the invention.

[0035] The case **10** has a full-height, removable lid or cover **12** on one end of a body tube **16**. On the other end, the case has a reduced-height, removable lid or cover **14**. The reduced-height lid **14** is considered to be the "front" of the case, while the full-height lid **12** is the "back." It will be appreciated that in reality the case can be used either way round.

[0036] Both the front and back lids **14, 12** are connected to the body **16** of the case by a plurality of straps or latches. For example, referring to **FIG. 3**, the front lid **14** is connected to the body **16** by a pair of latches **18, 20**, one on each side of the case. The rear lid is connected by four latches **22, 24, 26, 28**, one pair to a side. The latches are of conventional

construction. There are other ways for implementing the connection of the lids **12, 14** to the case body **16** such as, for example, using thumbwheel screws or other quick release fittings that could be mounted in recesses in the lids. These screws would connect to threaded bores in the case body **16**. However, alternative connections are not illustrated in the drawings.

[0037] Directing attention again to **FIG. 1**, a connector panel surface **30** is positioned below and recessed inwardly relative to an outer profile of the case and of the front lid **14**. The connector panel could be above the lid **14** or two connector panels may be provided both above and below the reduced-height lid. The connector panel surface **30** has a number of cable and electrical or other fittings **32, 34, 36**. These fittings are conventional in nature and depend on the specific components inside the case. When the case **10** is used to house electronics, the electrical connections can remain in place as the front lid **14** is removed from the case, or the back lid **12**, for that matter. As mentioned above, this enables maintenance or other kinds of work to be performed inside the case without necessarily shutting down operation of the components. Also, it is very easy to access the interior case because of the quick release mechanism provided by latches **18, 20** in the front, or **22, 24, 26, 28** in the back, depending on the situation.

[0038] Although the lid **12** has been shown as a full height lid it will be appreciated that the case may have a reduced height lid and one or two connector panels **30** at each end.

[0039] Referring to **FIG. 2**, the bottom surface **38** of the case **10** has four feet **40, 42, 44, 46**, which are mounted to the case in a conventional manner. Likewise, the top surface **48** of the case has a series of four foot locators **50, 52, 54, 56**. As illustrated in the drawings, these items are located near the corners of the case's body **16**.

[0040] The foot locators **50, 52, 54, 56** are arranged in an identical pattern to the feet **40, 42, 44, 46**. Referring to **FIGS. 13 and 14**, reference numeral **58** illustrates a cross-sectional view of a typical foot. Reference numeral **60** illustrates a cross-sectional view of a typical foot locator. When one case **10** is stacked on top of another, the foot **58** nests within foot locator **60** in the manner illustrated in **FIG. 14**. This enables the stacking arrangement illustrated in **FIG. 12**. In order to improve the ease of handling individual cases, a recessed or surface-mounted handle **62** can be connected to each side **64** of the case, in the manner shown in the drawings.

[0041] In a second embodiment as shown in **FIG. 15**, the rack mounted equipment case **10'** is of similar configuration to that described above and similar parts are identified by the same reference numerals with the addition of a prime symbol.

[0042] A normal inner frame **70** is suspended inside a body tube **16'** on shock mounts **72**. The case has one removable cover **12** and at the other end a flanged extrusion **74** is secured or welded to an inner wall of the body tube **16'** inboard of the first end. A connector panel (not shown) is secured to the extrusion **74** so that it is recessed relative to the outer profile of the case **10'** inwardly of the end face of the body tube **16'**. The cables and connectors pass through the connector panel as in the previous embodiment to the electronics mounted within. The connector panel closes the

whole of the end. A further protective cover may be available for providing enhanced protection when the electronics are not in use. The connector panel provides for shielding and sealing of the contents when the cover is not there. This results in space and weight savings.

[0043] A case that is constructed in the above manner may be used for many different kinds of military or industrial applications and other uses where unusual environmental conditions come into play. While it is not shown in the drawings, case 10 could be constructed with ventilation cut-outs or pressure relief valves, depending on whether or not the case is designed to be air-tight. As mentioned above, dimensions can vary depending on the particular application. The foregoing description sets forth two embodiments of the invention and is not necessarily intended to limit the scope of the patent right. Instead, the scope of the right is to be limited in accordance with the applicable doctrines relating to patent interpretation.

What is claimed is:

1. A rack mounted equipment case comprising a body tube having two ends, a connector panel secured to the body tube at a first end, and a removable lid at at least one end, wherein a surface of the connector panel is recessed relative to an outer profile of the case.

2. A rack mounted equipment case as claimed in claim 1, having a reduced-height, removable lid on the first end, and the connector panel surface is recessed relative to the reduced-height lid.

3. A rack mounted equipment case as claimed in claim 2, wherein the connector panel surface is positioned above or below the reduced-height lid.

4. A rack mounted equipment case as claimed in claim 2 or 3, having a full-height, removable lid on the other end.

5. A rack mounted equipment case as claimed in claim 3 having a full-height removable lid on the other end.

6. A rack mounted equipment case as claimed in claim 2, wherein a second recessed connector panel surface is provided on the other end.

7. A rack mounted equipment case as claimed in claim 1, wherein the connector panel is secured inboard of and closes the first end.

8. A rack mounted equipment case having a removable lid on an end, and a connector panel on the same end that is recessed relative to the removable lid.

9. A rack mounted equipment case as claimed in claim 8, wherein the or each connector panel surface is permanently secured to the case.

10. A rack mounted equipment case of claim 1, including a plurality of feet located on a bottom surface of the case, and a plurality of feet locators positioned on a top surface of the case, each foot being shaped to nest within a respective foot locator, the feet and feet locators being arranged in a substantially identical pattern to facilitate stable stacking of one equipment case on another.

11. The rack mounted equipment case of claim 1, including a plurality of latches for removably connecting each lid to the case.

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