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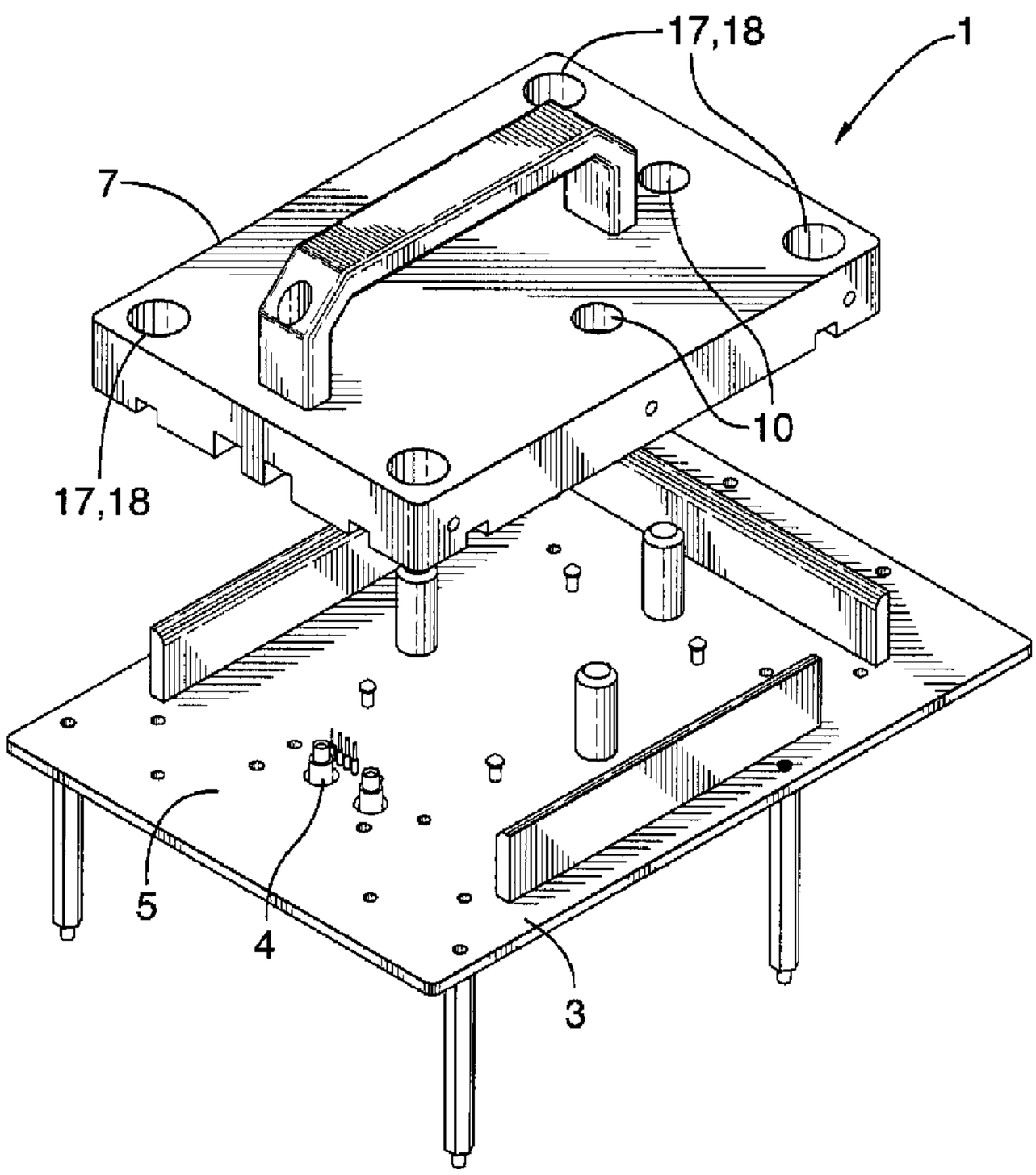
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(54) Title: CLAMPING TOP PLATE USING MAGNETIC FORCE




(57) Abrégé/Abstract:
A test fixture for testing an electronic device and a method of producing an electronic device are provided. The test fixture comprises: a test platform having a device receiving surface, the test platform including: electrically conductive contacts for

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(57) Abrégé(suite)/Abstract(continued):
connecting to the electronic device disposed on the a device receiving surface; at least one device positioning guide disposed on the device receiving surface; at least one platform magnetic member; a removable device retention cover for releaseably securing to the test platform, the retention cover comprising at least one cover magnetic member; wherein the at least one platform magnetic member and the at least one cover magnetic member are mutually magnetically attractive. The method comprises: preparing a test fixture as described above for testing the electronic device; placing the electronic device using the at least one device positioning guide disposed on the device receiving surface; and placing a device retention cover upon the electronic device to apply a force to the electronic device.

## ABSTRACT

A test fixture for testing an electronic device and a method of producing an electronic device are provided. The test fixture comprises: a test platform having a device receiving surface, the test platform including: electrically conductive contacts for connecting to the electronic device disposed on the a device receiving surface; at least one device positioning guide disposed on the device receiving surface; at least one platform magnetic member; a removable device retention cover for releaseably securing to the test platform, the retention cover comprising at least one cover magnetic member; wherein the at least one platform magnetic member and the at least one cover magnetic member are mutually magnetically attractive. The method comprises: preparing a test fixture as described above for testing the electronic device; placing the electronic device using the at least one device positioning guide disposed on the device receiving surface; and placing a device retention cover upon the electronic device to apply a force to the electronic device.

# CLAMPING TOP PLATE USING MAGNETIC FORCE

## TECHNICAL FIELD

**[0001]** The present disclosure relates to a test fixture for testing an electronic device, and more particularly to a test fixture that positions and then clamps an electronic device between a test platform and a manually removable clamping plate using magnetic attractive force.

## BACKGROUND

**[0002]** The testing of electronic components or devices during manufacturing involves use of a test fixture to accurately position the device under test so that electrical contacts are properly engaged to perform the test. Inaccurate placement or lack of appropriate electrical contact could result in a false rejection of the device under test and significant waste.

**[0003]** For example, power contacts and control system contacts on circuit board devices are engaged with matching contacts on a test fixture by manually or mechanically placing the circuit board device on the test fixture. Guide pins or other physical barriers are located on the test bed to accurately guide and locate the device to be tested into the correct testing position.

**[0004]** In the in use application of a circuit board device, the electrical contacts may be soldered, or engaged with tight fitting connectors, and the circuit boards are usually snap-locked, fastened or clamped securely in a housing to avoid malfunctions or short circuits in use.

**[0005]** However, in a test fixture, such secure means of making electrical contacts are inefficient and would interfere with the speed of testing required during manufacture. Test fixtures therefore include temporary means of making electrical contact which minimize the risk damage to the device under test and which aim to involve minimal time in positioning and withdrawing the devices under test to increase the speed of testing.

**[0006]** Since many electronic devices are very light weight and flexible, merely placing the devices in a test fixture is insufficient to ensure that proper electrical contact is made.

Commonly the device is physically clamped to exert pressure on the matching electric contacts and ensure that a reliable connection is made for conducting the testing procedure.

**[0007]** Pneumatic, hydraulic or mechanical clamping systems, including robotic systems are commonly used for this clamping function. However, all such systems require physical space in the manufacturing facility, require maintenance due to inevitable wear and tear of moving parts, and require periodic adjustments to maintain accuracy, consume power, impose operating and capital costs, and often create significant noise or safety hazards. In many cases, the test fixture and associated clamping system must be housed within a protective housing such as a radio frequency housing, a noise suppression housing, a dust proof housing, a temperature controlled housing or other protected environments. The use of mechanical, pneumatic or hydraulic clamping systems significantly increases the necessary space volume of any protective enclosure consuming manufacturing space and imposing various costs on the manufacturing process.

**[0008]** In view of the foregoing shortcomings in the art, an improved test fixture for testing an electronic device.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** In order that the subject matter may be readily understood, one embodiment of the subject matter is illustrated by way of example in the accompanying drawings.

**[0010]** Figure 1 is a top isometric view of one embodiment showing a test fixture with test platform with cylindrical pins as device positioning guides and at an elevated position a retention cover with manual grip handle having matching cylindrical recesses and having a cylindrical recess socket in each corner to house permanent corner.

**[0011]** Figure 2 is a like top isometric view showing an electronic device positioned on the electrically conductive contacts protruding from the test platform and aligned by the cylindrical pins serving as device positioning guides.

**[0012]** Figure 3 is a front isometric view showing the electronic device for testing position within the test platform and showing containment housing with hinged lid surrounding the entire test platform.

**[0013]** Figure 4 is a vertical sectional view through the housing and test platform as indicated with lines 4-4 in Figure 3.

**[0014]** Figure 5 is an isometric view along the same section shown in Figure 4.

**[0015]** Figure 6 is a bottom isometric view of the test fixture showing the bottom of the test platform with electrical contacts and platform magnetic members housed beneath the platform and showing the device retention cover with a receiving socket for receiving the electronic device therein.

**[0016]** Figure 7 is a detailed sectional view along lines 7-7 of Figure 2.

**[0017]** Further details of the test fixture and its advantages will be apparent from the detailed description included below.

**[0018]** It will be noted that throughout the accompanying drawings, like features are identified by like reference numerals.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

**[0019]** The present disclosure provides a test fixture for testing an electronic device that positions and then clamps an electronic device between a test platform and a manually removable clamping plate using magnetic attractive force.

**[0020]** There is provided a test fixture for testing an electronic device, comprising: a test platform having a device receiving surface, the test platform including: electrically conductive contacts for connecting to the electronic device disposed on the a device receiving surface; at least one device positioning guide disposed on the device receiving surface; at least one platform magnetic member; a removable device retention cover for releaseably securing to the test platform, the retention cover including at least one cover

magnetic member; wherein the at least one platform magnetic member and the at least one cover magnetic member are mutually magnetically attractive.

**[0021]** Further, there is provided a method for producing an electronic device, comprising: preparing a test fixture according to the present disclosure for testing the electronic device; placing the electronic device using the at least one device positioning guide disposed on the device receiving surface; and placing a device retention cover upon the electronic device to apply a force to the electronic device.

**[0022]** With reference to Figures 1 and 2, the test fixture 1 is provided for testing an electronic device 2 such as the illustrated circuit board for a wireless communication device.

**[0023]** The test fixture 1 includes a test platform 3 including electrically conducting contacts 4 (best seen in Figure 1) which protrude from a device receiving surface 5 of the test platform 3.

**[0024]** As best seen in Figures 2 and 3, the test platform 3 includes device positioning guides 6 disposed on the device receiving surface 5. In the embodiment illustrated, the device positioning guides 6 comprise cylindrical pins. However, it will understood that depending on the configuration of the electronic device 2, various other device positioning guides 6 can be provided such as planar members, shape conforming surfaces or rectangular protrusions for example.

**[0025]** It will also be understood that the test platform 3 can be easily reconfigured for various types of electronic devices 2 by removing the cylindrical pins 6 and relocating guides to different positions to accommodate different electronic devices 2.

**[0026]** The device retention cover 7 in the embodiment shown is a simple rectangular machined plate having a manual grip 8. As best seen in Figure 6, the device retention cover 7 preferably includes a device receiving socket 9 that engages the device 2 and exerts a downward pressure to maintain adequate contact with the electrically conducting contacts 4.

**[0027]** The device retention cover 7 is manually positioned using cylindrical recesses 10 positioned to match the cylindrical pins 6. Further, to guide the cover 7, the test platform 3

includes three peripheral walls 11 disposed on the device receiving surface 5 each aligned with an outside edge of the retention cover 7 when the retention cover 7 is a covered position over the electronic device 2. To improve manual guiding of the cover 7, the peripheral wall 11 includes an inwardly chamfered cover guiding edge 12.

**[0028]** As shown in Figures 4 and 6, preferably the text platform 3 includes adjustable height removable support legs 13 and is housed within a container housing 14 with a hinged lid 15 for access. As illustrated, the support leg 13 provides adaptability to change the test fixture 1 for varying sizes of electronic devices 2 and the containment housing 14 being a simple rectangular housing with hinged lid 15 can be adapted for various sizes and shapes of electronic devices 2 for testing. In one embodiment for example, the containment housing 14 comprises a radio frequency blocking enclosure. However, other protective environments can be provided in a like manner such as noise suppression housing, a dust proof housing or a temperature control housing.

**[0029]** Turning to Figures 1, 4 and 6, it can be seen that the test platform 3 includes a platform magnetic member 16 as illustrated in each of the four corners. The retention cover 7 likewise includes four cover magnetic members 17 are removably housed within a recess socket 18. It will be understood that in order to exert a clamping pressure on the electronic device 2, that the platform magnetic members 16 and the cover magnetic members 17 are mutually magnetically attractive. The degree of compressive force applied by the retention cover 7 can be easily modified by selecting appropriate permanent magnets for the platform magnetic member 16 and retention cover member 17.

**[0030]** The platform magnetic members 16 and retention cover magnetic members 17 are preferably mutually aligned on an axis normal to the test platform 3 as illustrated in the accompanying drawings. Alignment avoids any twisting of the cover 7 relative to the test platform 3 during installation and withdrawal.

**[0031]** As illustrated, the components of the test fixture 1 are preferably modular in design, easily removed and replaced in various positions. The modular design results in easy modification, flexibility and relative low cost. Compared to mechanical clamping systems, pneumatic or hydraulically actuated clamping devices, the test fixture 1 is low cost and small

size having only one moving part, the cover 7, that is manually positioned. Wear and tear of the fixture 1, maintenance and calibration are substantially reduced if not completely eliminated. The manual operation will alert the person performing the test to any misalignment or malfunction. As a result, safe operation is ensured, the device requires less space than mechanically operating clamping devices, and will be longer lasting requiring little maintenance while remaining simple to modify for various manufacturing applications.

**Claims:**

1. A test fixture for testing an electronic device, comprising:

a test platform having a device receiving surface, the test platform including:

electrically conductive contacts for connecting to the electronic device disposed on the device receiving surface; at least one device positioning guide disposed on the device receiving surface;

the test fixture further including a detachable device retention cover for releaseably securing the electronic device to the test platform; characterised in that

the test platform includes at least one platform magnetic member;

the detachable device retention cover comprises at least one cover magnetic member;

the at least one platform magnetic member and the at least one device retention cover magnetic member are mutually magnetically attractive to exert clamping pressure on the electronic device, detachment of the at least one cover magnetic member from the at least one platform magnetic member detaching the device retention cover from the test platform, and the device retention cover is a plate having a manual grip such that the device retention cover can be manually positioned and detached.

2. A test fixture according to claim 1, wherein at least one of the platform magnetic member and the cover magnetic member comprise a permanent magnet.

3. A test fixture according to claim 1 or claim 2, wherein the platform magnetic member and the cover magnetic member are mutually aligned on an axis normal to the test platform.

4. A test fixture according to any one of claims 1 to 3, wherein the cover magnetic member is removably housed within recessed socket.

5. A test fixture according to any one of claims 1 to 4, wherein the at least one device positioning guide comprises a cylindrical pin.

6. A test fixture according to claim 5, wherein the detachable device retention cover comprises at least one recess matching the cylindrical pin.

7. A test fixture according to any one of claims 1 to 6, wherein the test platform comprises at least one cover alignment guide disposed on the device receiving surface .

8. A test fixture according to claim 7 wherein the at least one cover alignment guide comprises a peripheral wall aligned with an outside edge of the detachable device retention cover in a covered position.

9. A test fixture according to claim 8, wherein the peripheral wall comprises an inwardly chamfered cover guiding edge.

10. A test fixture according to any one of claims 1 to 9, wherein the detachable device retention cover has a test platform facing surface with a device receiving socket (9).

11. A test fixture according to any one of claims 1 to 10, wherein the test platform comprises support legs.

12. A test fixture according to any one of claims 1 to 11, further comprising a containment housing.

13. A test fixture according to claim 12, wherein the containment housing comprises a radio frequency blocking enclosure.

14. A test fixture according to claim 12 or claim 13, wherein the containment housing has a hinged lid.

15. A test fixture according to any one of claims 1 to 14, comprising two or more platform magnetic members and two or more cover magnetic members, the platform magnetic members and cover magnetic members having a corresponding spatial arrangement for releaseably securing the detachable device retention cover to the test platform.

16. A method of producing an electronic device, comprising:

preparing a test fixture according to any one of claims 1 to 15, for testing the electronic device;

placing the electronic device using the at least one device positioning guide disposed on the device receiving surface;

manually positioning the detachable device retention cover upon the electronic device to exert clamping pressure on to the electronic device.

17. A method according to claim 16, wherein the step of placing the electronic device on the device receiving surface is manually performed.

18. A method according to any one of claims 16 to 17, wherein the method comprises the further step of closing a lid after the step of placing the detachable device retention cover upon the electronic device.

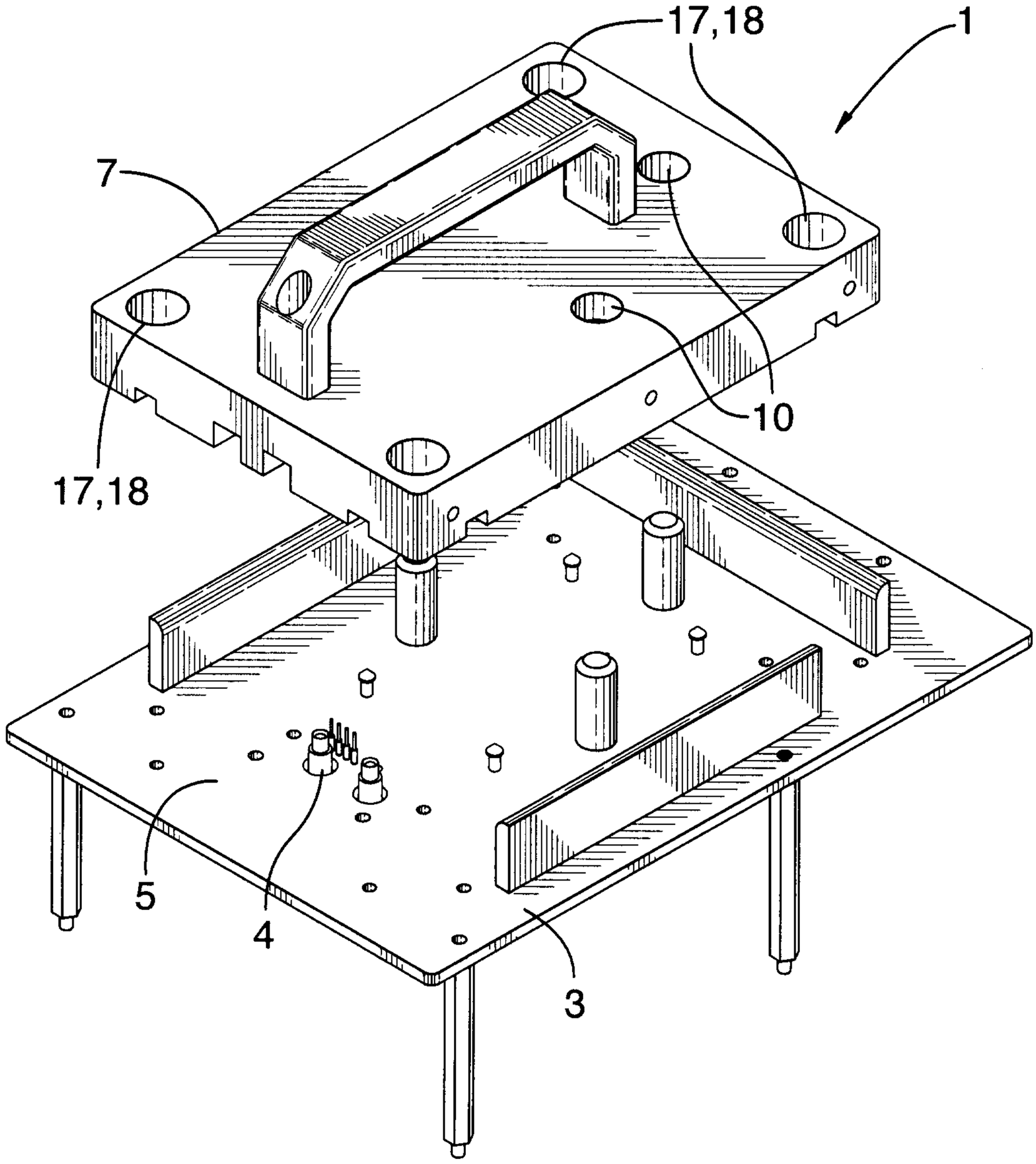



FIG.1

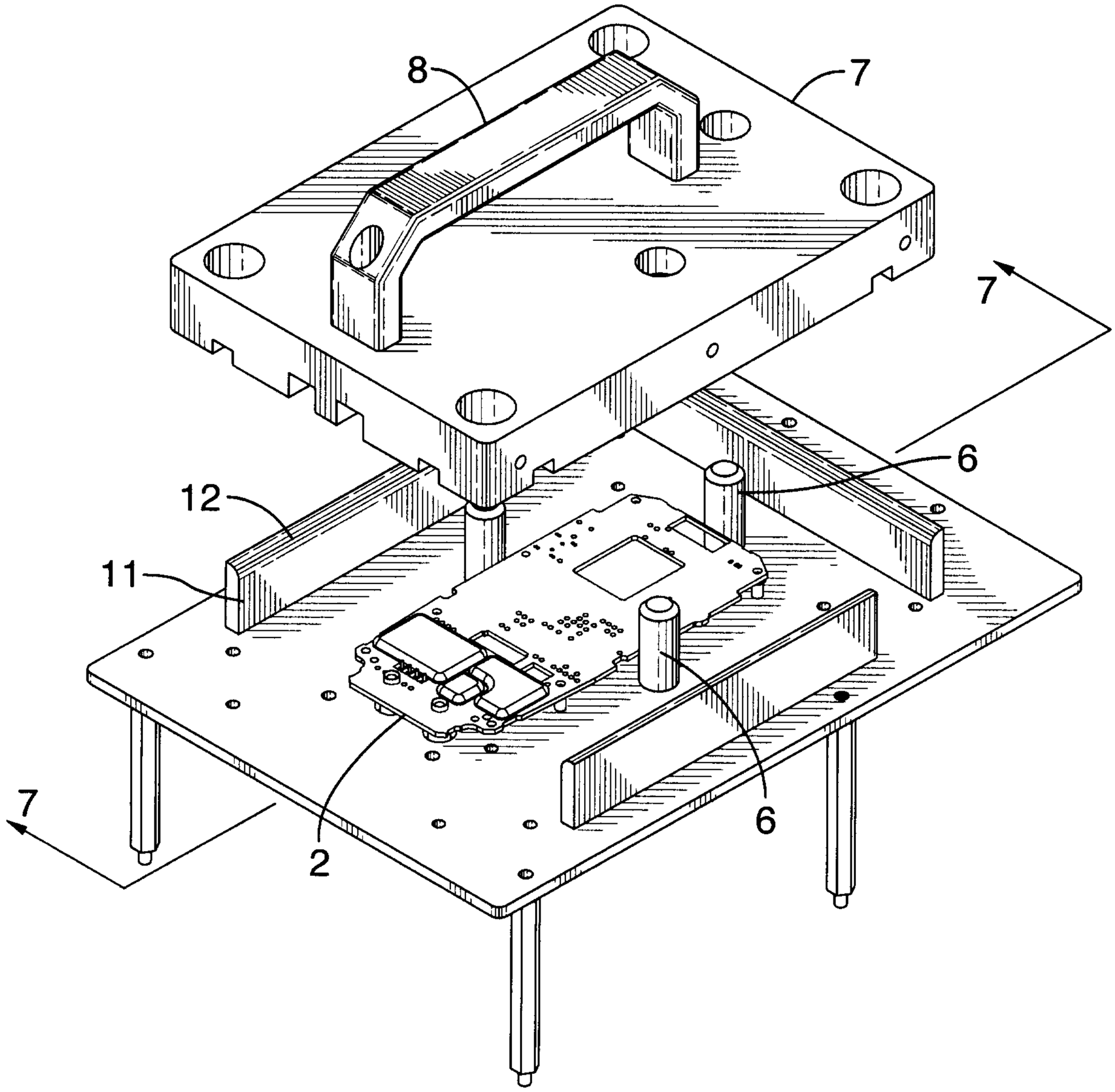



FIG.2

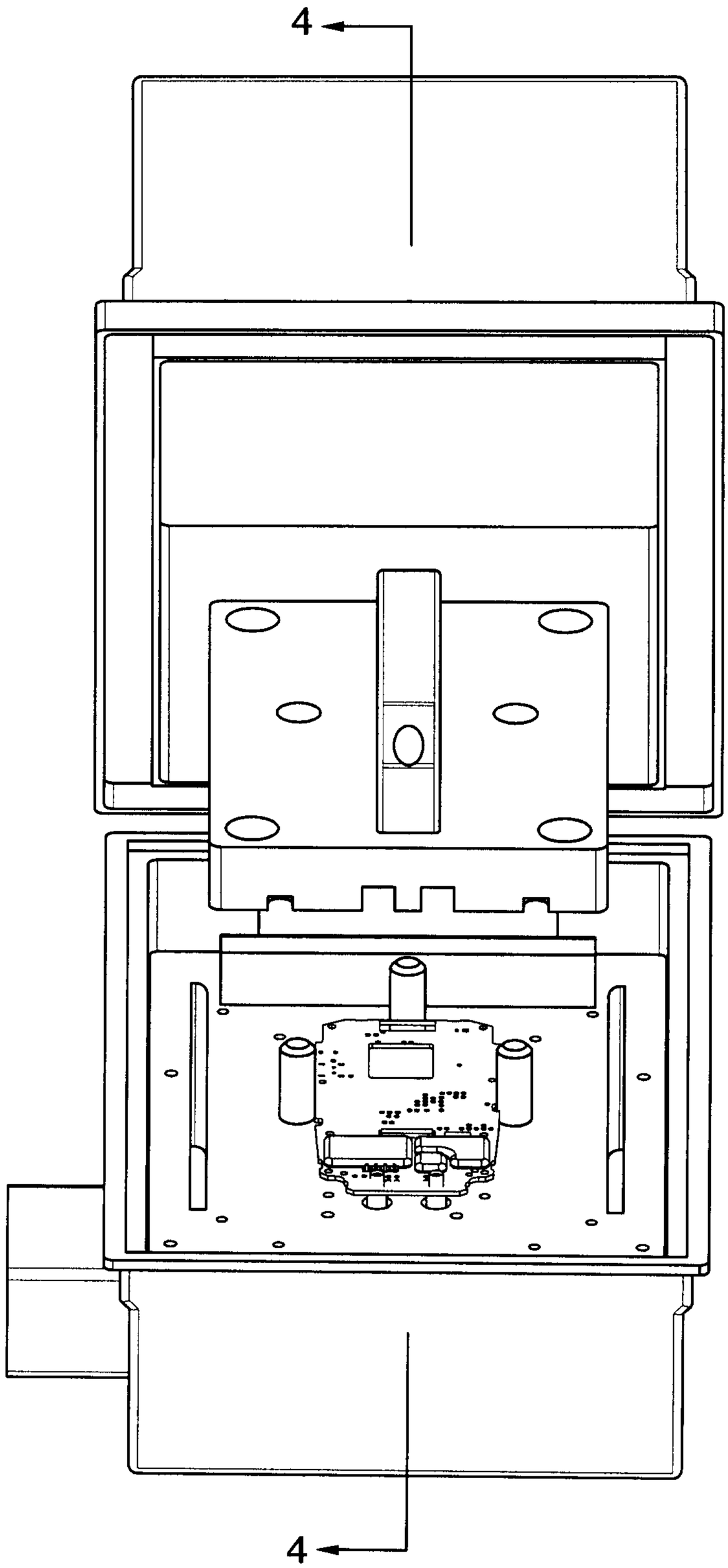



FIG.3

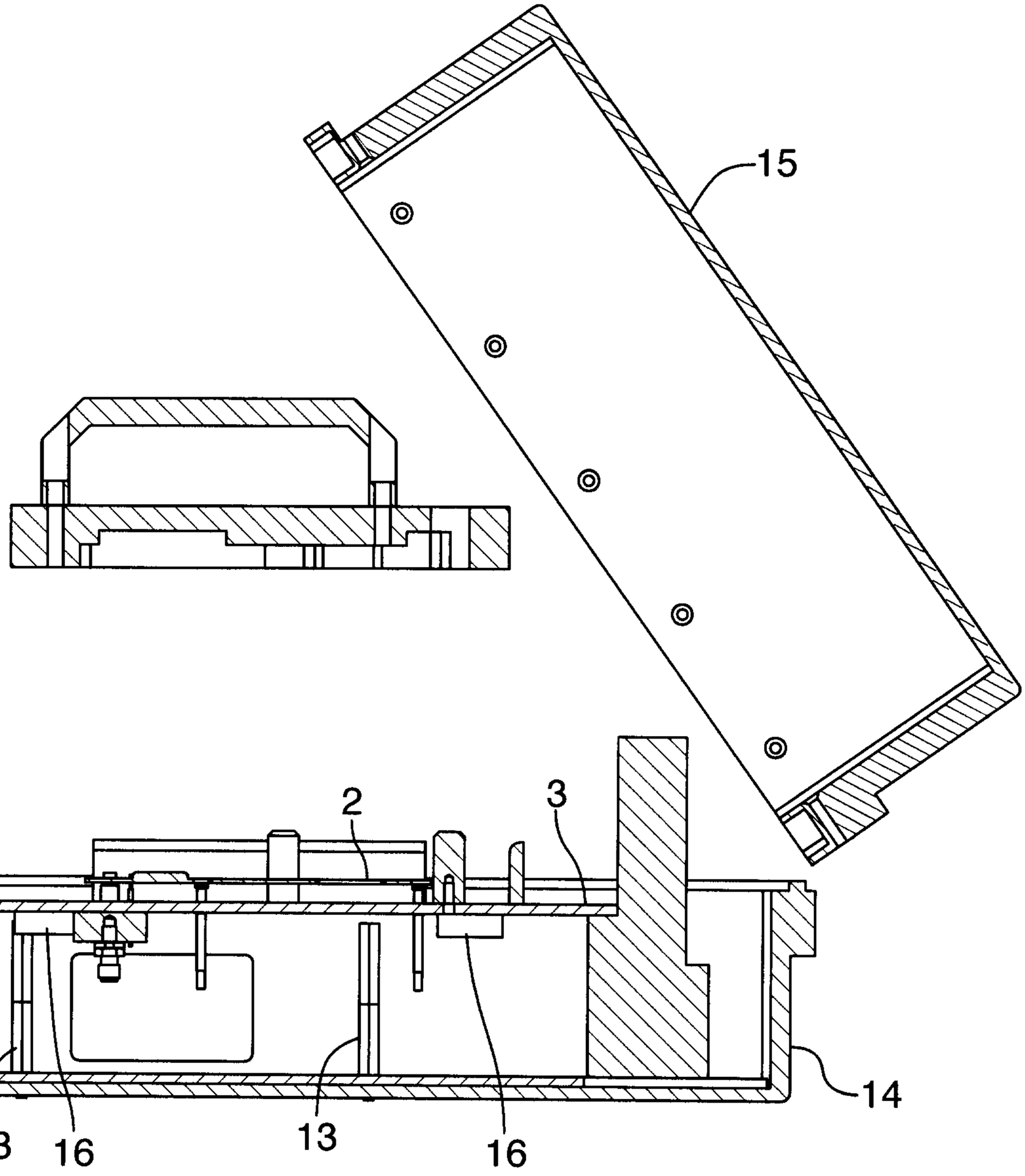



FIG.4

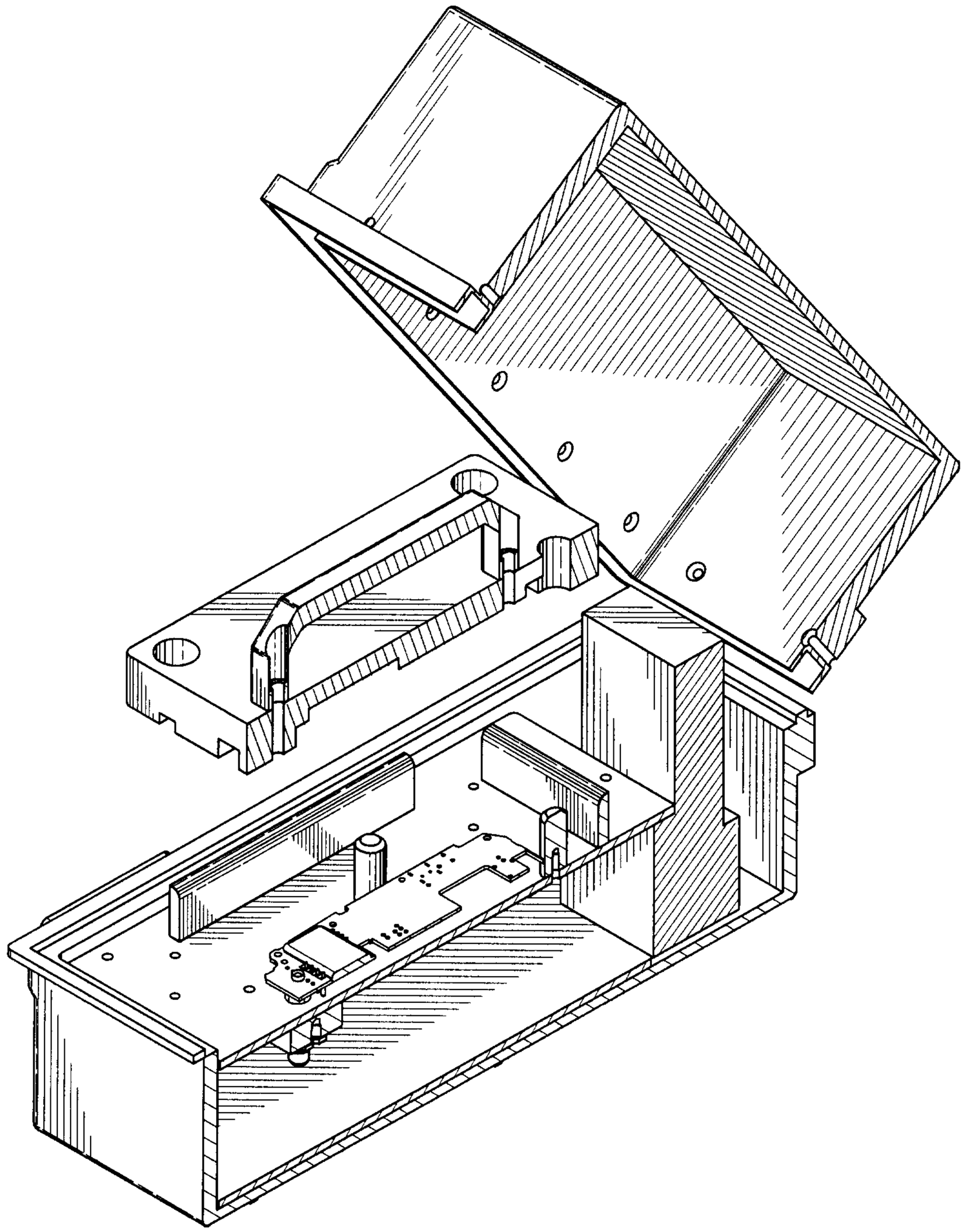


FIG.5

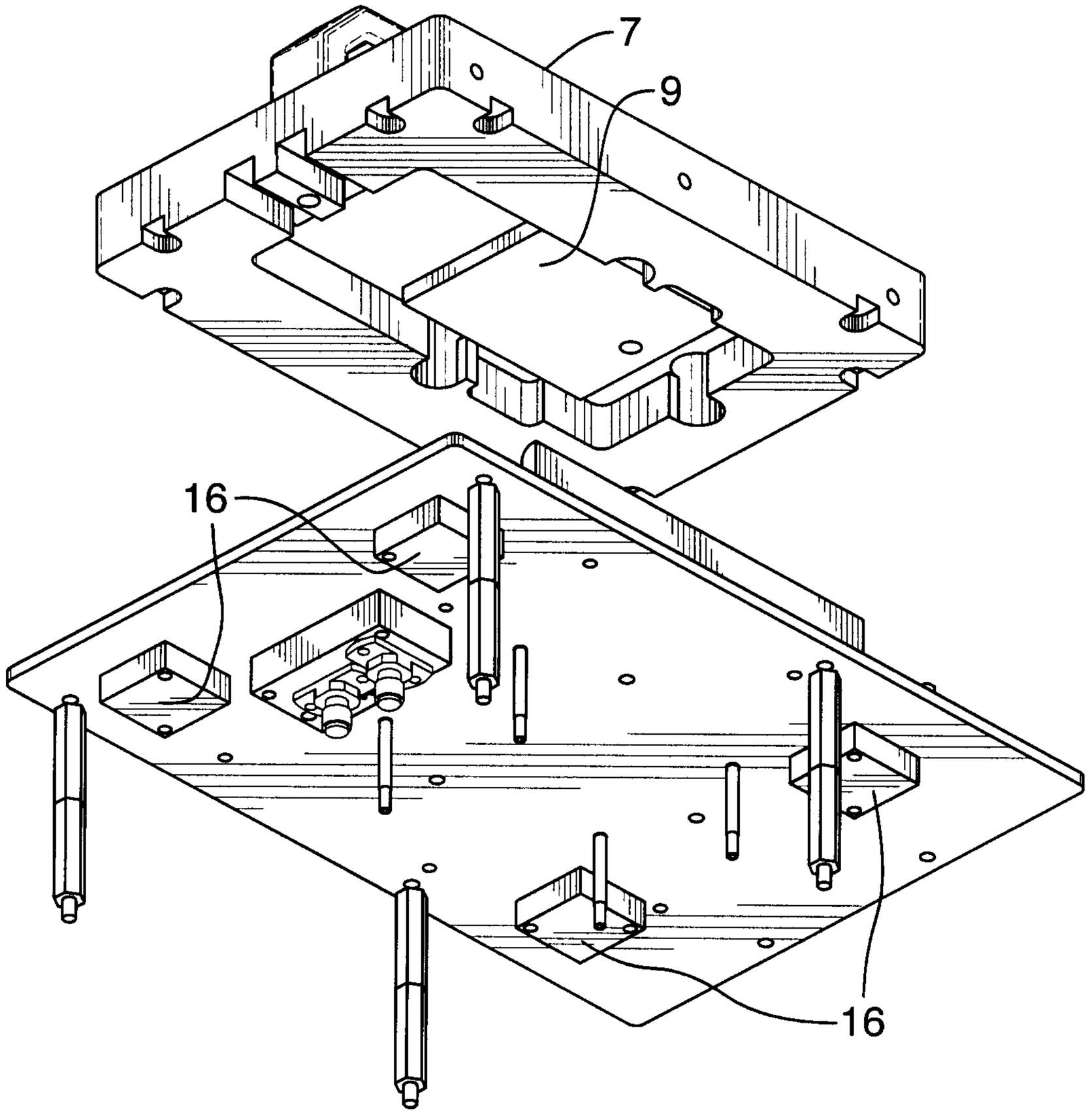



FIG.6

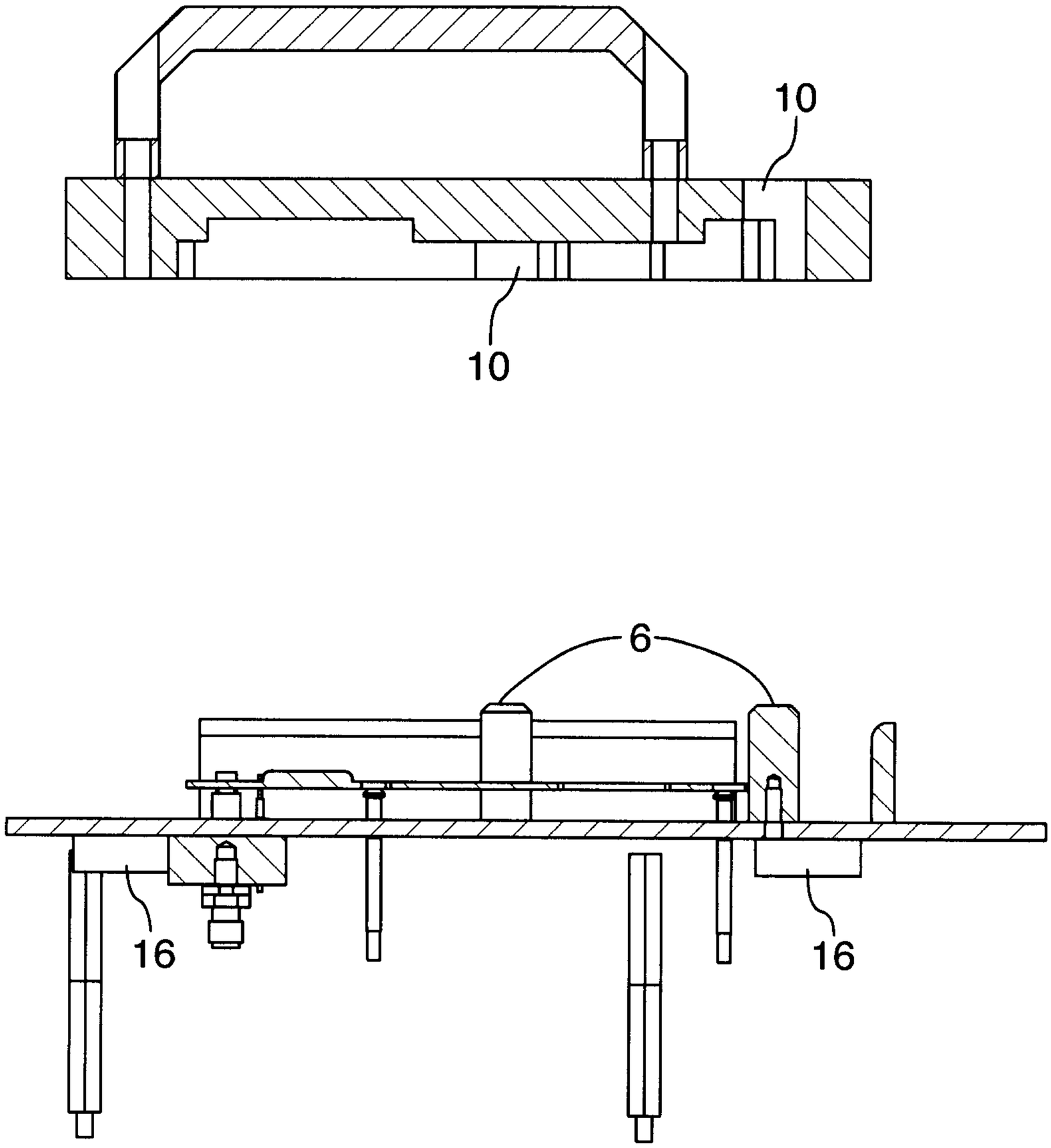
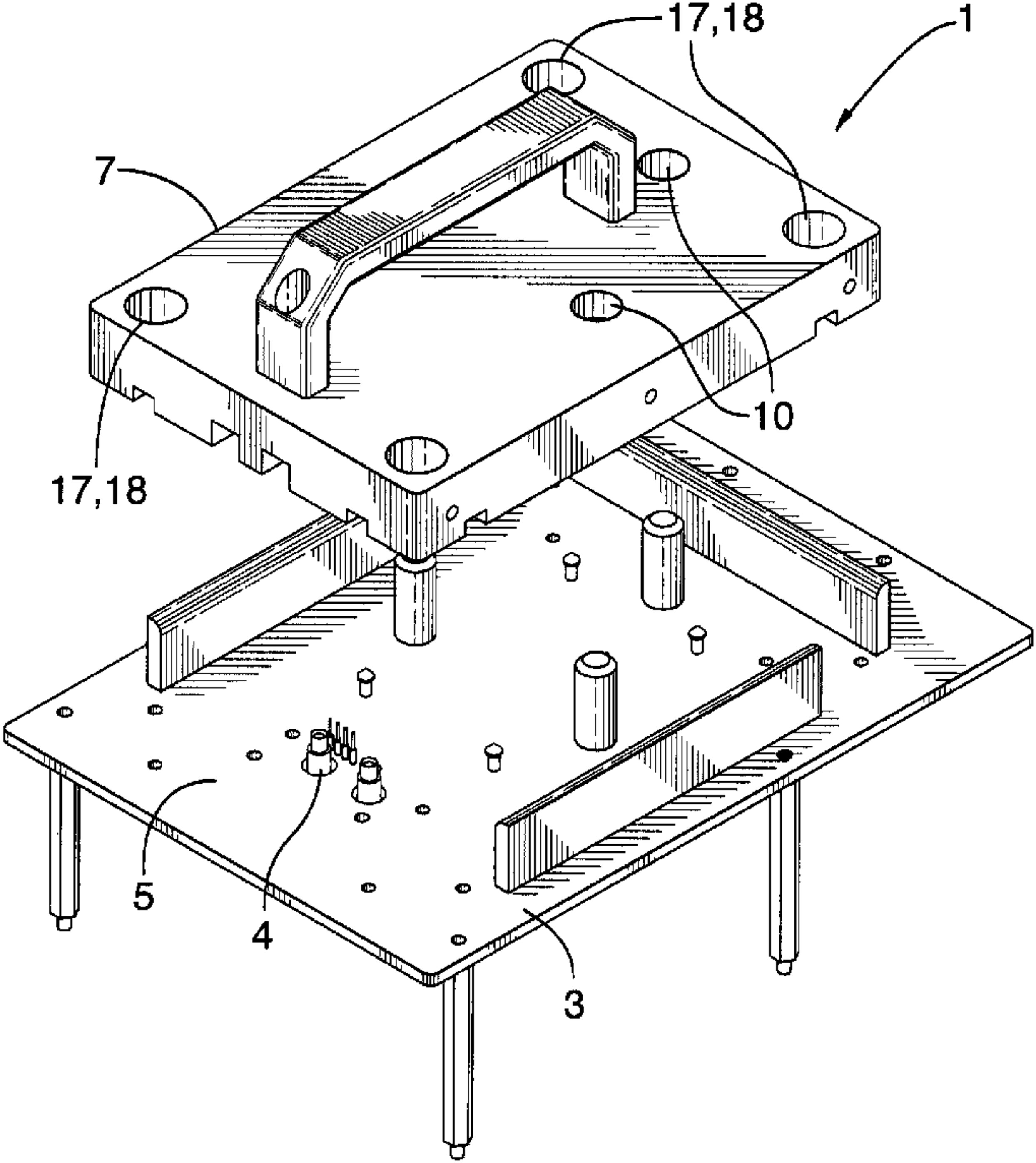



FIG.7


17,18
1
7
17,18
10
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4
3