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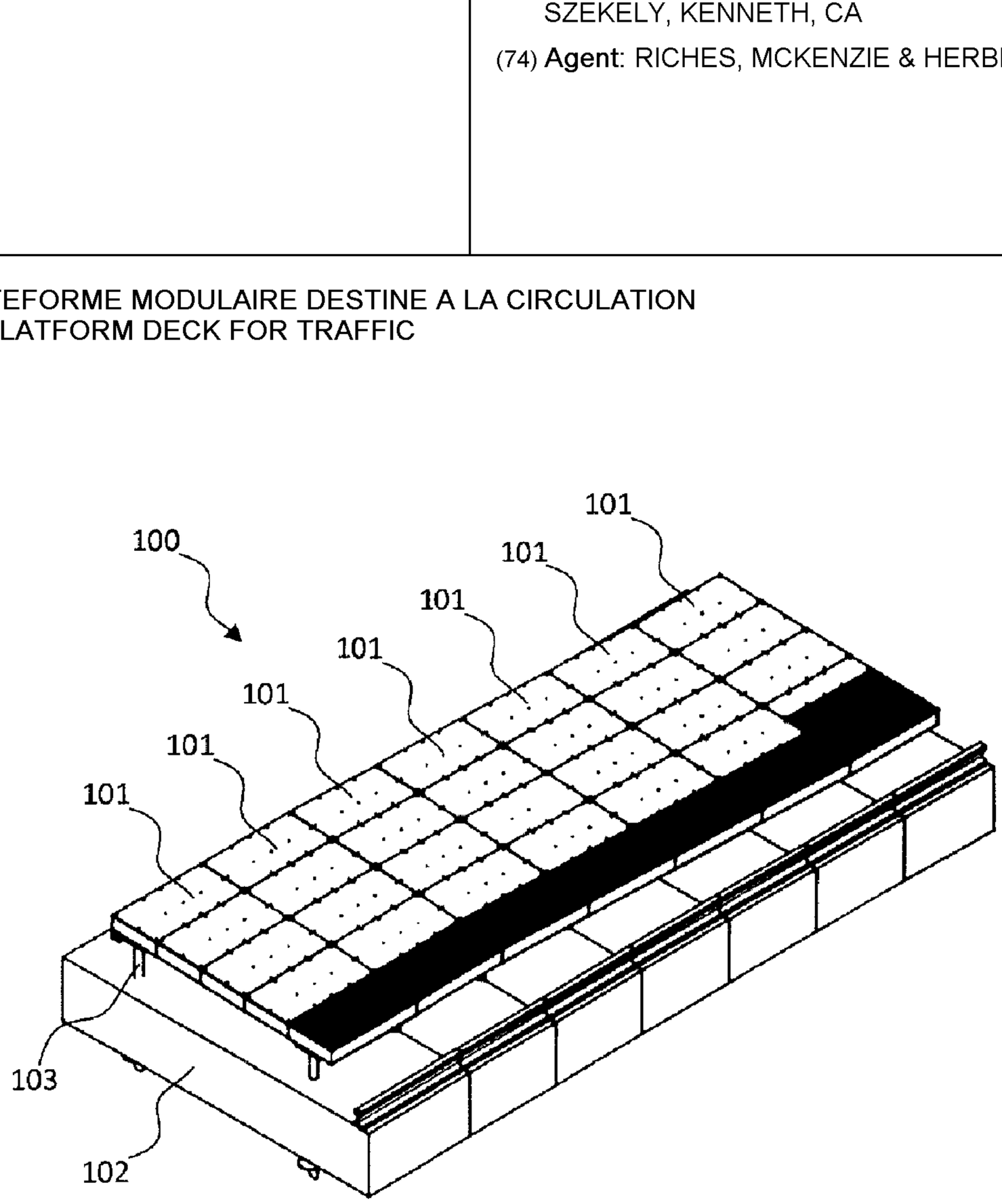


(57) Abrégé/Abstract:
A structural assembly comprising a base member, wherein the base member defines a top surface and grooves in a surface opposite the top surface; and a plurality of support members configured to be disposed in the grooves.

ABSTRACT

A structural assembly comprising a base member, wherein the base member defines a top surface and grooves in a surface opposite the top surface; and a plurality of support members configured to be disposed in the grooves.

MODULAR PLATFORM DECK FOR TRAFFIC

SCOPE OF THE INVENTION

[0001] This invention relates to modular platforms, and in most preferred aspects, modular platforms which are suitable for use in decking, pedestrian and/or vehicle pathways, as well as walkways and platforms used in transit facilities, public spaces and the like.

BACKGROUND OF THE INVENTION

[0002] In areas where there is pedestrian and vehicular traffic, particularly in publicly-accessible areas, it is common to have specific pedestrian pathways, such as walkways. Such walkways might include sidewalks, pedestrian or vehicular bridges, paved walkways through parks, patios, floor surfaces, and the like. Such pedestrian walkways exist in public transit facilities (e.g., subway stations), light rapid transit, bus rapid transit, railway stations, and other locations where there is pedestrian traffic. In many types of pedestrian walkways, there is a requirement for pedestrians to be able to safely navigate such walkways and to remain on the walkways, especially where public transit vehicles are passing closely by. This is particularly important for mass transit platforms near, for example, subways, buses, or trains where there is a need for safe pedestrian walkways.

[0003] Besides specific pathways for pedestrians, there can be a need for pedestrians to be able to maintain good traction on pedestrian walkways in order to prevent slips and falls, particularly on outdoor surfaces that can be subject to inclement weather such as wind, rain, snow, or ice.

[0004] Additionally, it may be important for pedestrians to be able to determine the presence of platform edges so that the pedestrians do not accidentally walk off the edge of a platform, especially if a vehicle might be passing by. This may be especially important in mass transit situations, and particularly for subways or commuter trains, where the side of the subway or train is right at the edge of the platform. The need for making the presence of

platform edges easy to determine may be of particular importance when making such facilities accessible and safe for blind or visually impaired persons.

[0005] Conventional concrete and wooden transit platforms may have a durability problem due to degradation by environmental chemicals such as salt, urea, acid rain, oils, and greases as well as stray electrical currents. This necessitates regular maintenance and periodic replacement of the platforms at considerable cost to transit authorities. Steel and concrete are also susceptible to corrosive elements, such as water, salt water, and agents present in the environment like acid rain, road salts, or chemicals. Environmental exposure of concrete structures leads to pitting and spalling in concrete and thereby results in severe cracking and a significant decrease in strength in the concrete structure. Steel is likewise susceptible to corrosion, such as rust, by chemical attack. The rusting of steel weakens the steel, transferring tensile load to the concrete, thereby cracking the structure. The rusting of steel in standalone applications requires ongoing maintenance, and after a period of time corrosion can result in failure of the structure. The planned life of steel structures is likewise reduced by rust. Wood has been another long-time building material for bridges and other structures. Wood, like concrete and steel, is also susceptible to environmental attack, especially by rot from weather and termites. In such environments, wood encounters a drastic reduction in strength which compromises the integrity of the structure. Moreover, wood undergoes accelerated deterioration in structures in marine environments, and is susceptible to fire damage.

[0006] Concrete structures are typically constructed with a monolithic concrete slab poured *in situ*, as well as using some preformed components pre-cast into structural components (e.g., supports) and transported to the site of the construction. Constructing such concrete structures *in situ* requires hauling building materials and heavy equipment and pouring and casting the components on site. This process often requires the use of cranes, which can be costly and difficult to use in the case of nearby overhead wires. The weight of concrete structures also increases the necessary foundational requirements, which can increase cost and complexity of construction. Consequently, this process of construction involves

lengthy construction times and is generally costly, time consuming, subject to delay due to weather and environmental conditions, and disruptive to existing traffic patterns.

[0007] Pre-cast concrete structural components are extremely heavy and bulky. Therefore, these are typically costly and difficult to transport to the site of construction due in part to their bulkiness and heavy weight. Although construction time is shortened as compared to poured *in situ*, extensive time, with resulting delays, is still a factor. Construction with such pre-cast forms is particularly difficult, if not impossible, in areas with difficult access or where the working area is severely restricted due to adjoining tracks, buildings, or platforms. In typical pre-cast concrete construction, tolerances of plus or minus one-quarter inch or more are common, making precise installation and alignment difficult. Pre-cast components also require the addition of a topping surface to create a finished, level surface.

SUMMARY OF THE INVENTION

[0008] While it has been found that conventional and pre-cast concrete structures are robust, the applicant has appreciated that a modular construction may present various advantages. Platform decking or structural assemblies which incorporate modular panels, modular tiles, and the like, for constructing pathways, such as pedestrian walkways and vehicular driveways, including mass transit platforms, wherein the top surface is readily removable and replaceable may facilitate construction and repairs. The applicant has recognized that modules, such as modular panels, modular tiles, and the like, for constructing pathways, such as pedestrian walkways and vehicular driveways may allow for the rehabilitation of platforms more cost effectively. Such modules further may be incorporated into a variety of different platform designs.

[0009] In a preferred embodiment, the present invention provides a platform which is formed as a structural assembly. In a non-limiting construction, the assembly includes a base member, wherein the base member defines a top surface and or channels in a surface opposite

the top surface; and a plurality of support members configured to be received or disposed in the grooves. Optionally, a heater may be situated between member layers which is removable and replaceable, as for example, to melt snow or effect moisture removal.

[0010] In another embodiment, a platform assembly is provided with modules which may include one or more of modular base member panels, modular tiles, and the like, with or without heating elements. The platform assembly may be provided for constructing pathways, such as pedestrian walkways and/or vehicular driveways.

[0011] In another embodiment, the structural assembly may optionally include one or more modular base members which themselves incorporate or provide water resistant modular panels, tiles or the like, and is used for constructing pathways, such as pedestrian walkways, vehicular driveways, or mass transit platforms.

[0012] Preferably, the platform structural assembly is a relatively lightweight structure which is adapted to facilitate simplified installation in areas with difficult access and/or restricted working areas. In addition, the lightweight structure is chosen to eliminate the costly concrete foundations and reinforced steel support systems necessary to support conventional concrete platforms.

[0013] In another embodiment, a modular readily customizable assembly, such as for a transit platform is provided, and which allows for the selection and/or substitution of one or more modular base members tailored to each individual installation site.

[0014] In accordance with one aspect of the present invention there is disclosed a novel modular assembly for use in constructing a platform or other pathway for traffic. The assembly is preferably provided with a number of modules or base members which are secured in groupings on a module-receiving frame or a series of sub-frames for mounting over a surface on a series of support piles.

[0015] The modules may optionally be provided with a base having a top surface with or without a perimeter edge. In one non-limiting construction, a replaceable top plate is

securable to the base. The plate may be provided with a desired colour, texturing and/or material depending on application. In one embodiment, the top panel has a plurality of horizontally spaced upwardly projecting button structures, including solid button structures and fastener-receiving button structures. Alternately, the top surface of each module could be textured on rubberized for foot or vehicle traffic.

[0016] In transit applications, fastener-receiving button structures are each integrally formed with the top plate. The fastener-receiving button structures preferably each comprise an upwardly projecting peripheral portion and a depressed central portion. Fastener-receiving apertures are disposed one within each of the depressed central portion and are each surrounded by the upwardly projecting peripheral portion. Optionally, a cap member is securable within the depressed central portion of each fastener-receiving button structure.

[0017] In another non-limiting construction, individual modules or base members may be selectively placed through the structural assembly in perimeter-edge to perimeter-edge relation, with different top plate and/or top surface textures, colours and/or materials used to identify different platform regions and/or traffic areas. For ease of customization, in one aspect, top plate is secured to the base member by mechanical fasteners extending through the fastener-receiving apertures of the top plate and securely engaged in a lower deck module element of the base member.

[0018] Other advantages, features and characteristics of the present invention, as well as methods of operation and functions of the related elements of the structure, and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] For a fuller understanding of the nature and objects of the disclosure, reference should be made to the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of an embodiment of a modular assembly on a receiving surface in accordance with the present disclosure;

FIG. 2 is a view of an embodiment of a modular assembly in both assembled and partially exploded forms;

FIG. 3 shows front and side facing views of an embodiment of a modular assembly in accordance with the present disclosure;

FIG. 4 is a perspective view of a modular assembly with a heater assembly in accordance with the present disclosure;

FIG. 5 is a top view of an embodiment of the heater assembly shown in FIG. 4 in accordance with a preferred embodiment;

FIG. 6 is an exploded view of the embodiment of FIG. 4;

FIG. 7 is another exploded view of the embodiment of FIG. 4;

FIG. 8 is a top perspective view of an embodiment of a modular sub-frame assembly in accordance with another embodiment of the invention;

FIG. 9 is a bottom perspective view of the embodiment of a modular sub-frame assembly shown in Figure 8;

FIG. 10 is a view of an embodiment of a modular assembly in accordance with another embodiment;

FIG. 11 is an exploded view of a modular assembly on helical piers as support piles;

FIG. 12 illustrates a clamp connection to an I beam used in the mounting of base members in accordance with a preferred construction;

FIG. 13 illustrates a second clamp connection used to secure base members and the support frame structure to an I beam;

FIG. 14 illustrates an adjustable bearing plate used in mounting of the base members and support frame on a support pile;

FIG. 15 illustrates a second adjustable bearing plate used in mounting of the base members and support frame to support pile;

FIG. 16 is a partially exploded view of a modular assembly in accordance with a further embodiment;

FIG. 17 is a partially exploded view of base member installation;

FIG. 18 is another exploded view of the embodiment of FIG. 4;

FIG. 19 shows a partially exploded view of a railing connection;

FIG. 20 shows a perspective end view of a mounting bracket for a railing connection;

FIG. 21 shows schematically views of the connection between a railing and the base members;

FIG. 22 shows schematically plan, side and end views of a modular structural assembly with an alignment plate; and

FIG. 23 shows schematically a base member for use in association with the structural assembly of the present invention.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0020] Although claimed subject matter will be described in terms of certain embodiments, other embodiments, including embodiments that do not provide all of the benefits and features set forth herein, are also within the scope of this disclosure. Various structural, process step and electronic changes may be made without departing from the scope of the disclosure.

[0021] A structural assembly 100 for decks, panels, platforms, boardwalks, floors, and the like is provided. The structural assembly 100 is provided with a generally modular construction, and preferably includes one or more arrays of individual base members which, as will be described, are coupled to one or more frame support members 105. Optionally, the frame support members 105 may be secured by one or more cross-braces or other connecting rails, beams or support in the form of a braced sub-support frame, and more preferably a U-shaped or generally rectangular sub-support frame. The modular assembly is mounted on supporting members piers or optionally directly on ground or grade. In particular applications, the modular structural assembly 100 may be used as or in conjunction with a transit platform, such as that at a train, subway, or bus station.

[0022] The structural assembly 100 disclosed herein is easier to assemble than a concrete platform. Compared to existing systems, the modular assembly is preformed, easy to

install, and easy to remove or replace. The modular nature of the structural assembly 100 allows it to be assembled or replaced quickly, which minimizes disruptions. Assembly or replacement can be easily performed even in areas with difficult access and/or restricted working areas. The assembly modules may be made of a lightweight, strong, and durable material, such as a composite material.

[0023] Furthermore, safety is improved using the modular assembly disclosed herein. In many types of pedestrian walkways, there is a requirement for pedestrians to be able to safely navigate such walkways and to remain on the walkways, especially where public transit vehicles are passing nearby. This may be particularly important for mass transit platforms in public transit facilities. The structural assembly 100 disclosed herein can be customized to provide warnings proximate the edges, directions or other indicia, slip-resistant surfaces, and/or heating systems to melt snow and ice. The modular assembly may also include, or entirely comprise, photoluminescent materials to provide information to pedestrians and/or vehicle operators. For example, exit, safety, warning, and/or related indicators can be included into the upper platform surface 200 of the assembly 100 for the purposes of conveying information. Accidents, such as slips and falls, can be prevented.

[0024] FIG. 1 is a perspective view of an embodiment of a modular structural assembly 100 used to provide a platform surface 200, and which is on a receiving surface 102 using piles 103. The structural assembly 100 includes multiple modular base members 101 which are coupled in arrayed grouping to an associated sub-support frame 124. The receiving surface 102 may be, for example, a compacted gravel surface, a concrete surface, or other selected surfaces. The base members 101 are connected to the piles 103 via the frame 124. In one non-limiting construction, the piles 103 are disposed in the ground, and which is another example of a receiving surface 102.

[0025] While illustrated in Figure 1 as approximately rectangular, the modular base members 101 can also be square, polygonal, or other shapes.

[0026] The base members 101 are preferably lightweight, and most preferably have an individual weight selected a less than about 250 kg, preferably less than about 150 kg, and more preferably less than about 100 kg.

[0027] The base members 101 may be water-resistant due to the materials that are used. The base member 101 also may provide improved drainage due to the materials or shape. For example, the top surface of an individual the base member 101 may be angled or the base member 101 may include drainage channels on the surface or drain pipes.

[0028] The base members 101 can be resistant to salt, urea, acid rain, oils, greases, stray electrical currents, or other environment factors. Unlike wood, the base members 101 can be chosen from a variety of materials, such as rubber and/or polymer compositions, and which are impervious to rot or termites.

[0029] In non-limiting embodiment, the base members 101 are themselves provided with a series of modular members or panels which are generally rectangular in shape. The base members 101 are typically greater than 1 meter to less than 5 meters in length, and less than 1 meter in width, and preferably about 5 to 20 centimeters in height. It has been found that this size and shape is suitable for the intended applications. It should be understood that the base members 101 could be larger or smaller depending on application and the members 101 could be of any suitable shape, thickness and size.

[0030] FIG. 2 shows a perspective view of an embodiment of the modular structural assembly (Fig. 2(a)) 100 in both assembled and partially exploded (Fig. 2(a)) forms. As with FIG. 1, the structural assembly 100 includes multiple base members 101, each with a top surface 115 and an opposing bottom surface 116 that includes the channels 106. In the embodiment of FIG. 2, the modular structural assembly 100 includes five base members 101 which are mounted in an edge-to-edge array to the sub-support frame 124, although other numbers and configurations of base members 101 are possible. One of the base members 101 includes top surface 115 with a textured surface 104. It is appreciated that more than one of the base members 101 could include the textured surface 104, such as on the top surface 115

that a pedestrian can walk on. The textured surface 104 can vary in shape and/or material from the raised cylindrical bumps illustrated, and can provide an enhanced grip for pedestrians and/or a warning to a pedestrian that he or she is, for example, nearing an edge of a platform. As will be described, the textured surface 104 may be provided integral to a top surface panel 112 (Figure 7) which may be replaceable or customizable. Other warnings or benefits are possible.

[0031] It is recognized that other arrays of base members 101 than that illustrated can be arranged in a two-dimensional pattern.

[0032] In alternative embodiments, the top surface of each base member 101 is provided as a detainable, generally planar panel 112 (Figure 4) formed of a non-composite material such as a tile, concrete, or the like.

[0033] The base members 101 preferably include two channels 106, each sized for mated engagement with an associated side frame support member 105 of the sub-support frame 124. Each of the support members 105 are configured to be disposed in one of the channels 106. The support members 105 may be made of a metal, such as a steel or aluminum and in a most preferred construction are formed of metal, with a generally hollow square cross-sectional dimensioned at between about 0.1 and 0.3 meters; and with a longitudinal length of preferably 1 and 10 meters, and more preferably 3 to 5 meters. Different sized support members 105 may also be used. The support members 105 can also be made of a non-metal material, such as a composite material, like fiberglass. The support members 105 may be a tube, beam, or other structural element. The support members 105 may be permanently or releasably fastened to the base members 101, by mechanical fasteners such as using bolts or screws and may be fixed relative to each other by one or more cross-supports, beams, or other suitable connectors.

[0034] Besides or in conjunction with fasteners, the support members 105 may be clamped to the base members 101 using a mounting bracket or a clamping mechanism. In an example, the support member 105 is provided in the form of a metal I beam, and the base

members 101 may be provided with Z clip mounting bracket. The Z clip mounting bracket may be fabricated of stainless steel to resist corrosion.

[0035] As seen in FIG. 7, the channels 106 include a primary portion 120 and a secondary portion 121. The support member 105 is sized to be matingly positioned in the primary portion 120.

[0036] Turning back to FIG. 2, a wiring raceway 109 is positioned on the support members 105 as part of the support frame 124 or as a separate raceway structure. The wiring raceway 109 may define a hollow raceway or recess which can include wires for a heating assembly in one or more of the base member 101, electrical lighting wiring, communications wiring, or other wiring.

[0037] FIG. 3 includes front and side facing views of an installation of a modular structural assembly 100 in accordance with another embodiment wherein like reference numbers are used to identify like components. As shown in FIG. 3, the structural assembly 100 is arranged on a receiving surface 102 with or so as to provide a platform surface 200 with a non-constant grade. The shape of the base members 101, position of the piles 103, or the position of individual base members 101 on the piles 103 can be configured to accommodate and/or achieve the non-constant grade.

[0038] Piles 103 can be used to anchor the structural assembly 100 to the ground as the receiving surface 102, and support the individual base members 101 and associate frame structure 105 above the ground. In one embodiment, conventional foundation piles (not shown) can be used, where a precast concrete pile or steel beam is driven into the soil bed. In other embodiments, a helical screw pile 103 may be used to produce a deep foundation that can be installed quickly with minimal noise and vibration. For example, screw piles 103 may be efficiently wound into the ground using a Bobcat™ or other suitable rotary tool. This is an efficient means of installation and coupled with their mechanism of dispersing load, provides effective in-ground performance in a range of soils, including earthquake zones with liquefaction potential. Using this technique, the structures may be above a body of water.

The ground may also include artificial supporting fillers, such as concrete. Such structures include buildings, bridges, decks, panels, platforms, and boardwalks.

[0039] Piles 103 can also be installed by pre-drilling a hole in a soil bed (as the receiving surface 102) using an auger and lowering a pre-molded pile into the hole. A hybrid system also exists between the driving and drilling methods whereby an open ended pile is driven into a soil bed, after which point the soil inside the pile is augered out and concrete is poured in the cavity formed therein. Cast and hole methods as well as casons may also be used, specifically where there are concerns for preserving nearby buildings against the problems discussed above. A pile also can be attached to a drill head which is substantially larger than the diameter of the pile itself. The pile is turned together with the drill head by a drilling rig to create a passage in the soil bed through which the pile may pass. A conduit is provided through the center of the pile for water or grout to be pumped down and out the tip of the drill head to either float away debris or anchor the pile in its final resting place in the soil bed.

[0040] Figures 4 to 7 illustrate perspective views of a modular base member 101 construction for use in the structural assembly 100, and which includes a heater assembly 108, a lower deck module 107 and a top surface panel 112, and which are assembled in a stacked arrangement. FIG. 5 shows a plan view showing the heater assembly 108. In a preferred construction, the heater assembly 108 includes an electric silicone heater. Other heaters can be used, including other thin sheet-type electrically powered heaters and heaters sandwiched by a composite material. The heater assembly 108 also can include an electric enclosure 110 and a power cable 111. Some embodiments may also include a grounding plate.

[0041] FIGS. 6 and 7 show exploded views of base member 101 shown in FIG. 4. The heater assembly 108 can be positioned between the surface top panel 112 and the deck module 107. As can be seen in FIG. 7, the deck module 107 may include a cavity 113 or other suitable recess or pocket that can accommodate, for example, the electric enclosure 110 and/or power cable 111 together with required connectors. The deck module 107 and surface panel 112 may be fastened together, such as using bolts or screws. For example, fastener

holes 119 (only one of which referred to in FIG. 7 for simplicity) can be used with the fasteners. In yet other embodiments the surface panel 112 can be embedded or recessed into the deck module 107.

[0042] The deck module 107 functions as the support base of the base member 10. The deck module 107 includes a first end wall depending from a generally planar top deck surface at a first end, a second end wall depending from the top deck surface at the second opposite end, a first side wall depending from the top deck at the first longitudinal side and a second side wall depending from the top deck at the second side. The end and side walls each terminate at a respective bottom edge that together form the bottom peripheral edge of the deck module 107. Preferably, as shown in the illustrated embodiment, the portion of the deck module 107 defined by the ends of the top deck surface, a respective end, and an adjacent longitudinal end portion of each sidewall define respectively each channel 106. Further, the bottom peripheral edge of the deck module 107 may be selected to directly engage a receiving surface 102, such as a compacted gravel surface, or the like. Optionally, the underside of the top deck 107 may be provided with one or more reinforcing webs, or interior cross-supports or ribs (114) Figure 8 which span between deck module ends and/or sides, for increased load capacity and/or structural integrity.

[0043] The base member 101 can include a coating that is configured to seal the heater assembly 108 between the deck module 107 and the surface panel 112. This can prevent moisture from impairing operation of the heater assembly 108. The coating may be continuous around the entire base member 101 where the deck module 107 and surface panel 112 meet. Seals or other devices also can be used to prevent the impact of moisture.

[0044] In an instance, the heater assembly 108 is in direct contact with the surface panel 112 to maximize heat transfer. In another instance, an adhesive or filler between the heater assembly 108 and the surface panel 112 is used to provide improved heat transfer.

[0045] The deck module 107 may be configured to direct heat toward the surface panel 112, as for example by the inclusion of suitable thermally reflective coatings. This will

preferentially direct heat from the heater assembly 108 toward the surface panel 112. A reflective surface and/or insulation may be used to direct heat away from the deck module 107.

[0046] In a particular embodiment, pre-molded insulation or foamed insulation can fill the open spaces of the base member 101, such as between the various internal cross support members or ribs 112 of the deck module 107, or in other locations. The insulation precludes heat from the heater assembly 108 from escaping downwardly through the base member 101, thereby allowing for more efficient heating of the surface panel 112. The insulation can be either a low density type of foam or a high density type of foam (e.g., a structural foam) to provide additional structural support. Furthermore, a ceramic layer, can be placed between the surface panel 112 and the deck module 107.

[0047] The surface panel 112 on top of the base member 101 may be made of a suitable clear, semi-transparent or opaque material such as a composite, polymer plastic material, vinyl, rubber, urethane, ceramic, glass reinforced plastic, concrete, or similar materials. The surface panel 112 may include visual indicators or designs (e.g. arrows, warnings, symbols, etc.), and/or graphics (text, logos, advertisements, etc.), thereon or may permit viewing of indicia or an underlying surface therethrough. The surface panel 112 may also include or be made of a luminescent material.

[0048] The surface panel 112 on top of the base member 101 may include any suitable polymer plastic material or fiber glass type material, and can include a heat conductive polymer material and/or a heat retentive polymer material. The surface panel 112 may also include a fire retardant. The surface panel 112 may be made according to known composite manufacturing methods, such as being made as a sheet molded compound (SMC), bulk molding composite (BMC), wet compression molding, injection molding, or the like. The heat conductive polymer material allows for quick conduction of heat from the heater assembly 108 through the surface panel 112 and to the exposed surface of the surface panel 112 to permit quick melting of snow and ice. The heat retentive polymer material can retain heat within the heater assembly 108 once the electrical power to the heater assembly 108 has

been turned off, thereby allowing for a longer cycle time until electrical power needs to be applied again to retain sufficient heat to melt snow and ice. It is also possible to include small stones, or the like, in the polymer material in order to preclude wearing of the surface panel 112. It should be noted that small stones, aluminum oxide, silica sand, or the like, cannot be included if the surface panel 112 is formed via a compression molding method. It should also be noted that fillers such as the heat conductive polymer material and the heat retentive polymer material may degrade the UV resistance of the resin used to form the surface panel 112. Accordingly, a UV resistant coating can be sprayed on top of the surface panel 112.

[0049] A slip-resistant coating may be added to the surface panel 112. The slip resistant coating can be of a non-slip monolithic walking surface. The slip-resistant coating can be resistant to the effects of ultraviolet radiation, temperature changes, and/or corrosive elements such as acids, alkalis, salts, phosphates, organic chemicals, and solvents such as mineral spirits, or gasoline. It also may be sufficiently hard to protect against abrasion, chipping, scratching, or marring. Alternatively, or additionally, an additional structure may be attached to the surface panel, or serve as the surface panel. For example, a concrete layer (e.g. paver) or tile (e.g. porcelain) can be added to the surface panel 112.

[0050] Selective heating of the individual base members 101 is possible to maximize energy efficiently, and reduce operations cost. For example, in a modular structural assembly 100 selected base members 101 under a roof or enclosure may not be heated as much, as often, or as long as those not under a roof that may be exposed to snow. In the structural assembly 100, some base members 101 may be heated (sequentially or simultaneously) while other base members 101 are not heated. Selective heating of the base members 101 can also be performed based on one or more sensors embedded within and/or attached to the assembly. Alternatively or additionally, one or more sensors may be located remote from the assembly 100 for the purposes of making a determination to selectively heat base members 101. For example, the one or more sensors can include moisture, temperature, wind, pressure, or the like. Based on information from the one or more sensors (e.g. a determination of snow, ice, or similar precipitation), a controller can be used to automatically heat one or more of the base

members 101. This can save on heating costs or can focus heating on areas prone to snow or ice.

[0051] Selective heating of the structural assembly 100 also is possible. The timing, duration, and extent of heating can vary for a particular structural assembly 100 placement or design.

[0052] Selective heating may use a controller in electrical communication with one or more heater assemblies 108. The controller can be configured to activate, deactivate, and/or change heat settings for individual heaters in the structure assembly 100.

[0053] FIG. 7 also illustrates a groove 118 or moulded recess formed within the deck module 107. This groove 118 may be used to connect with a frame support member 105 as a bearing member, and/or allows for the heads of mechanical fasteners, such as bolts or screws to be recessed within the top surface of the deck module 107.

[0054] The base members 101 can include interlocking mechanisms for coupling to next adjacent base members 101. These interlocking mechanisms can be tongue and groove designs or other designs. For example, as seen in FIG. 7, the grooves 117 on the edges of the base member deck modules 107 can be used as part of an interlocking mechanism. Other shapes and placements of the groove 117 are possible, such as a groove that is positioned over less of the edge of the base member 101. Multiple interlocking mechanisms also may be used on a single edge of a base member 101, such as including multiple tongue and groove interlocking mechanisms. The interlocking mechanism, such as the groove 117 of a tongue and groove interlocking mechanism, can include a seal to provide a seamless connection between base members 101 and/or to prevent moisture or other materials from falling between the base members 101.

[0055] Interlocking mechanisms, such as using one or more tongue and grooves on an edge of a base member 101, can be configured to enable the construction a modular structural assembly 100 with a platform surface 200 that includes a non-constant grade. For example, the structural assembly 100 of FIG. 3 can use interlocking mechanisms that are configured to

allow for the intersections that provide the non-constant grade. The top surfaces of the base members 101 also can be shaped to allow for the intersections that provide the non-constant grade.

[0056] FIGs. 8 and 9 show respectively top and bottom perspective views of another embodiment of the modular structural assembly 100, wherein like reference number are used to identify like components. As can be seen in FIG. 9, the bottom of each of the base members 101 can include support ribs 114. The support ribs 114 extend longitudinally along the underside of the deck module 107 and can provide strength to the base member 101 while providing reduced weight. The support ribs 114 can be arranged in a parallel spaced grid pattern or in other patterns.

[0057] Parts of the base members 101 can be made by a compression molding process or method, such as sheet molded compound (SMC) or wet compression molding. Parts of the base members 101 also can be made by pultrusion, hand lay-up, or other suitable methods including resin transfer molding (RTM), vacuum curing and filament winding, automated layup methods, or other methods.

[0058] Embodiments of the structural assembly 100 disclosed herein can be assembled in the field or pre-formed. A pre-formed modular assembly may be provided with groupings multiple base members 100 attached to pairs of support members 105. Thus, a string of base members may be provided.

[0059] FIG. 10 is a view of an embodiment of a modular structural assembly 100 that has been assembled in accordance with a further embodiment, wherein like reference numerals identify like components. As seen in FIG. 10, the structural assembly 100 changes elevation and includes a railing 130 and a textured top surface edge 132. The textured surface edge 132 may be made of individual warning tiles. Additional tiles (e.g., armored tiles) may be positioned at the platform edge. In an instance, no excavation, wood header, backfilling, or maintenance related to the wood header or asphalt is required. Construction time may be

faster than traditional techniques and a snow melt system can be integrated into some or all of the platform.

[0060] FIG. 11 is an exploded view of a modular structural assembly 100 on helical piers 103 wherein like reference numerals are used to identify like components. Helical piers 103 enable a wide range of soil and load applications. Load capacity can be based on torque achieved at installation. An optional height adjustable bearing plate 134 (Figure 12) can be included to allow flexibility. For example, a portion of the helical pile 103, and/or the clamp connection may be threaded for the purposes of adjusting the height.

[0061] FIGs. 12 and 13 illustrate an exemplary clamp connection between a helical pile 103 and an I beam 140 used in the support of the support frame 124 at a desired height above the receiving surface. A mechanical connection may be made via a fastening plate 144 which is bolted to one or more frame support members 105 or by welding. A threaded connection element 136 of the bearing plate 134 allows for adjusting the height of the connection.

[0062] FIGs. 14 and 15 illustrate adjustable bearing plates 134 shown in accordance with another embodiments. The illustrated embodiments of the height adjustable bearing plate 134 allow flexibility and final levelling of the platform surface, with the clamping plate 144 securing the base members 101 and sub-support frame 124 to the bearing plate 134 and pile 103.

[0063] FIG. 16 is a partially exploded view of a modular support assembly 100 in accordance with a further embodiment wherein like reference numerals are used to identify like components. In an instance, the structural assembly 100 includes multiple 2' x 4' wide base members 101 or panels. In the construction shown in Figures 16 and 17, groupings of five base members 101 are coupled to associated sub-frames 124 as a modular sub assembly 151, and which are arranged on piers 103 in a side-by-side orientation. It is to be appreciated that the invention is not so limited. In alternate configurations, fewer or larger number of

base members 101 could be connected to sub-frames 124 as a platform module in their own right, as part of a modular sub assembly 151.

[0064] FIG. 17 shows an exploded view of a base member 101 construction. The base members 101 are positioned on an associated support frame 124 and attached to the helical piers 103.

[0065] FIG. 18 shows exploded view of a further embodiment of the base member 101 shown in FIG. 4, wherein like reference numerals are used to identify like components. In the embodiment shown, the base member 101 is provided as a deck module 107 (i.e. the bottom module), a heater assembly 108, and which includes a detachable textured top surface panel 112 and include graphics on the top surface which are visible through the top plate.

[0066] FIGs. 19 to 21 are views of a railing connection 150 in accordance with a preferred embodiment and further a connecting bracket 152 used to couple a railing to an end of a frame support member 105. FIG. 21 includes views of a railing plate connection 156 used to couple the railing post 148 and the base members 101. As seen in FIG. 21, the railing plate connection 156 connects two juxtaposed base members 101 using fasteners, such as bolts.

[0067] FIG. 22 shows bottom (Fig 22(a)), side (Fig. 22(b)), top (Fig. 22 (c)), and end (Fig. 22(d)) views of part of a structural assembly 100 with an alignment plate 170, and wherein like reference numerals and used to identify like components. The alignment plate 170 is used to maintain line or alignment of edge portions of sub-assemblies 151.

[0068] Variations in design are possible due to the flexibility and relative low cost of tooling used in the manufacturing process. Panel size, length, width, thickness, color, ribbing, and surface profiles can be modified to suit specific project requirements. Drainage details also can be modified to suit specific project requirements.

[0069] FIG. 23 shows schematically perspective (Fig. 23(a)), top (Fig. 23(b)), bottom (Fig. 23(c)), and sectional views (Fig. 23(d)(e)(f)) of a further base member 101 in accordance

with a further embodiment, and wherein like reference numerals are used to identify like components. The dimensions in FIG. 23 are indicated in inches, however, other dimensions are possible. The graphics shown in FIG. 23 also are exemplary.

[0070] The embodiments of the structural assembly 100 disclosed herein solve the problem of durability and premature breakdown of concrete and wood platforms due to degradation. The light weight of the structural assembly facilitates ease of installation in areas which have difficult access and work windows. The structural assembly 100 also solves the problem of dealing with heavy concrete platforms which necessitate the use of costly foundations and steel support systems. These benefits apply to both new and retrofit construction requirements. Reduced maintenance and long life cycles are achieved.

We claim:

1. A structural assembly comprising:
   a base member, wherein the base member defines a top surface and grooves in a surface opposite the top surface; and
   a plurality of support members configured to be disposed in the grooves.

2. The structural assembly of claim 1, wherein the structural assembly comprises two support members.

3. The structural assembly of claim 1, wherein the support members are steel beams.

4. The structural assembly of claim 1, wherein the support members are steel tubes.

5. The structural assembly of claim 1, wherein the base member includes a deck module and a surface panel disposed on the deck module.

6. The structural assembly of claim 5, further comprising a heater assembly disposed between the deck module and the surface panel.

7. The structural assembly of claim 6, wherein the heater assembly includes an electric silicone heater.

8. The structural assembly of claim 6, further comprising a coating configured to seal the heater assembly between the deck module and the surface panel.

9. The structural assembly of claim 6, wherein the deck module is configured to direct heat toward the surface panel and/or away from the deck module.

10. The structural assembly of claim 6, further comprising a controller in electronic communication with the heater assembly.

11. The structural assembly of claim 10, wherein the controller is configured to activate and/or change heat settings of the heater assembly.

12. The structural assembly of claim 11, wherein the structural assembly includes a plurality of the base members, wherein each of the base members includes at least one of the heater assembly, and wherein the controller is in electronic communication with the heater assembly in each of the base members.

13. The structural assembly of claim 1, wherein the base member includes an interlocking mechanism.

14. The structural assembly of claim 13, further comprising a plurality of the base members connected using the interlocking mechanisms.

15. The structural assembly of claim 1, wherein the top surface includes a textured surface configured to warn a pedestrian nearing an edge of the base member.

16. The structural assembly of claim 1, wherein the top surface includes a slip-resistant coating.

17. The structural assembly of claim 1, further comprising a plurality of piles, wherein the support members are disposed on the piles.

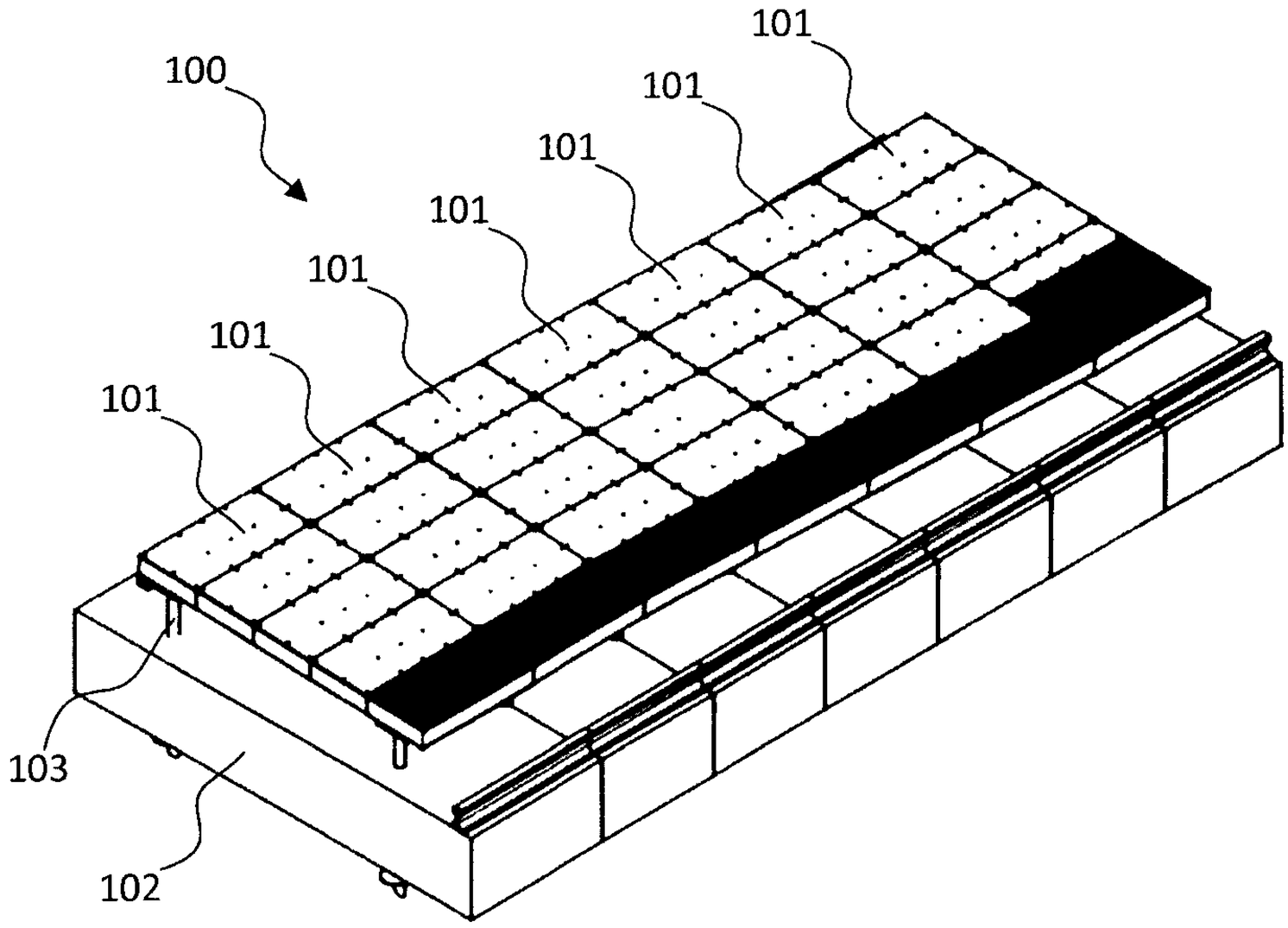
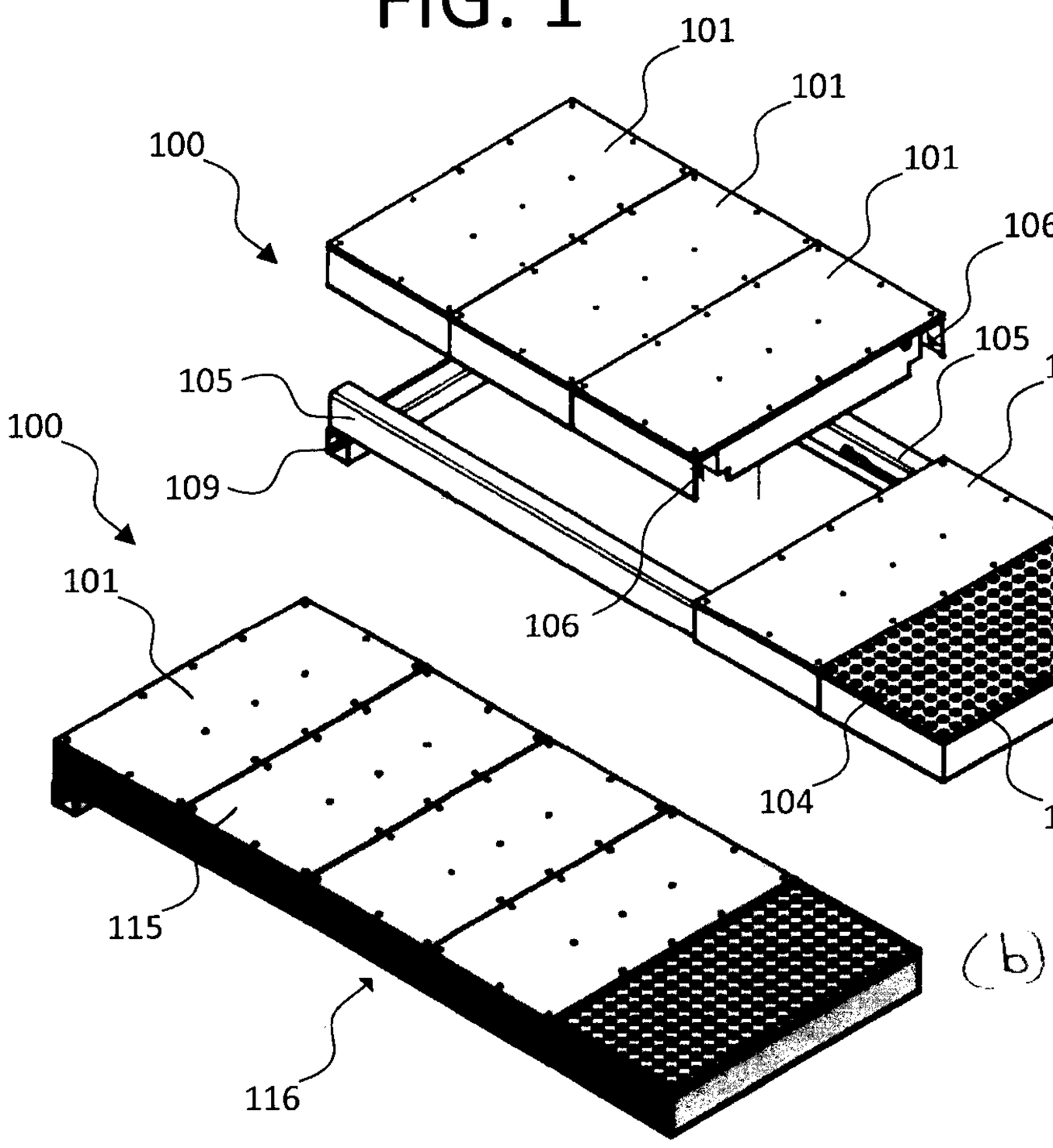

100
101
101
101
101
101
101
103
102

FIG. 1


100
101
101
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106
105
101
105
109
106
104
101
(a)
100
101
115
116
(b)

FIG. 2

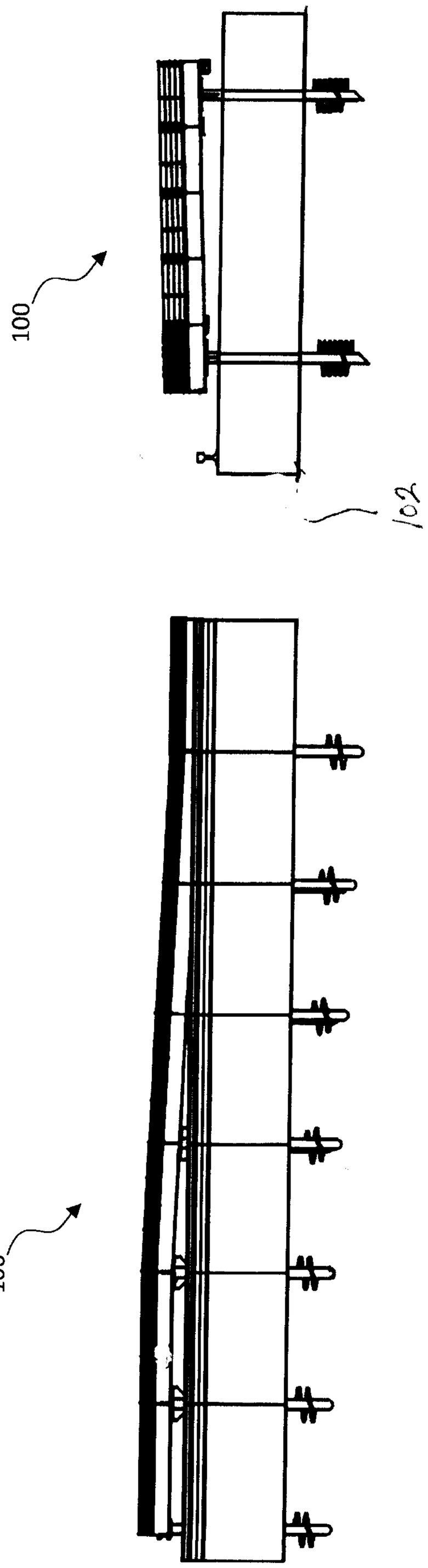


FIG. 3

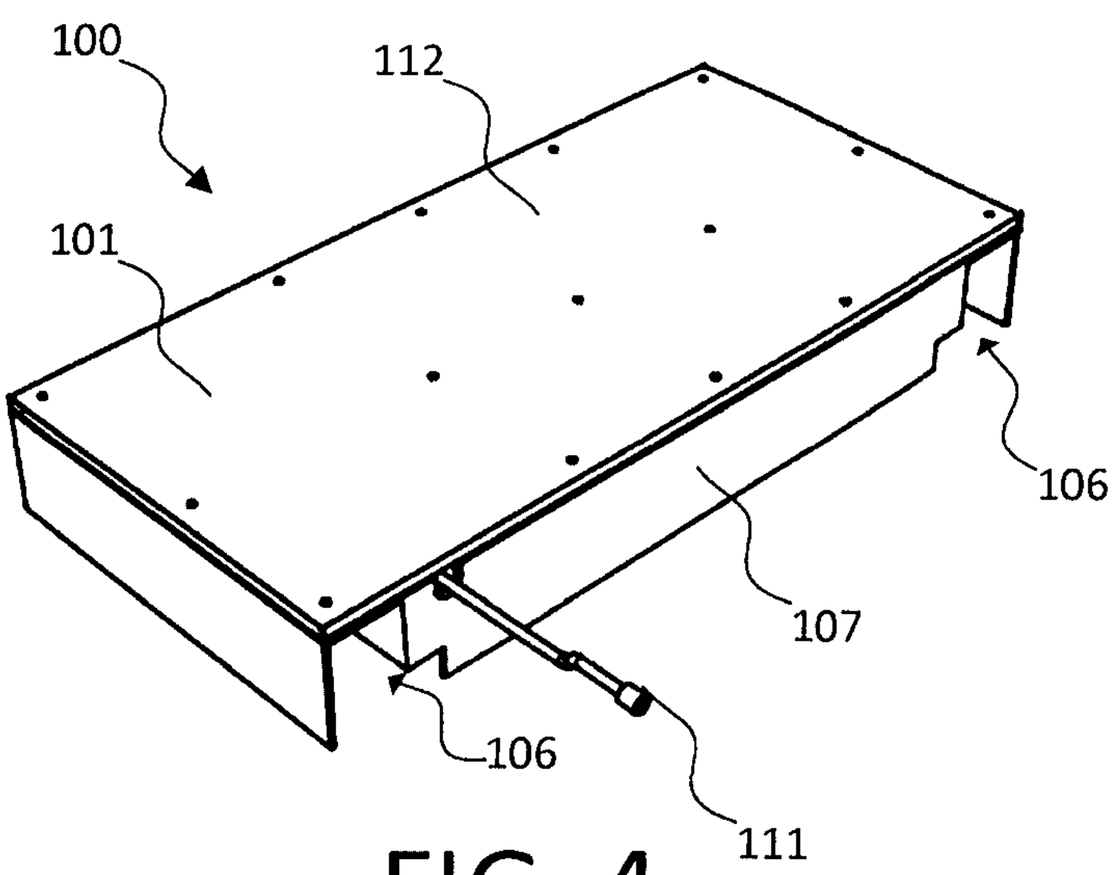


FIG. 4

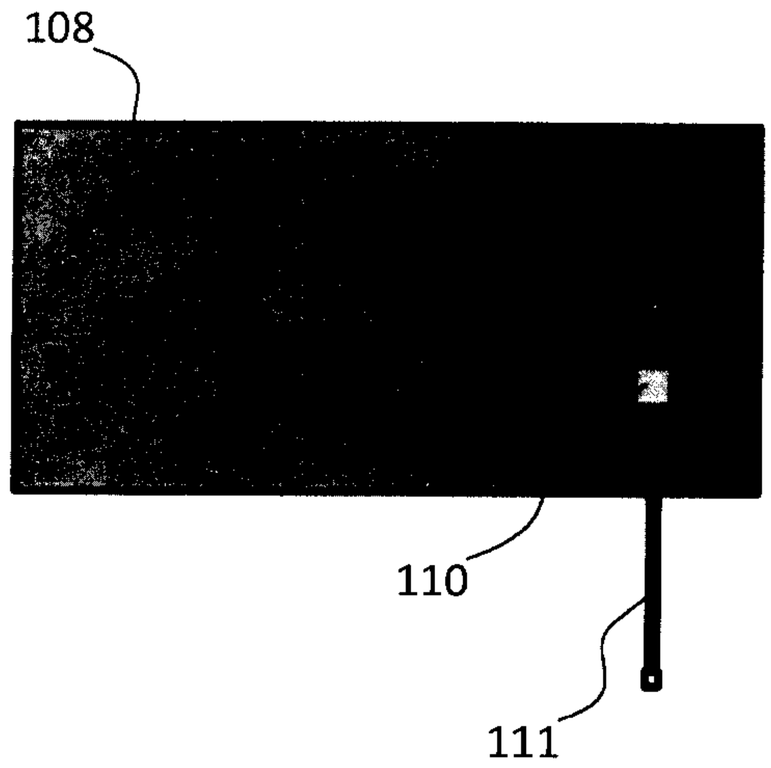


FIG. 5

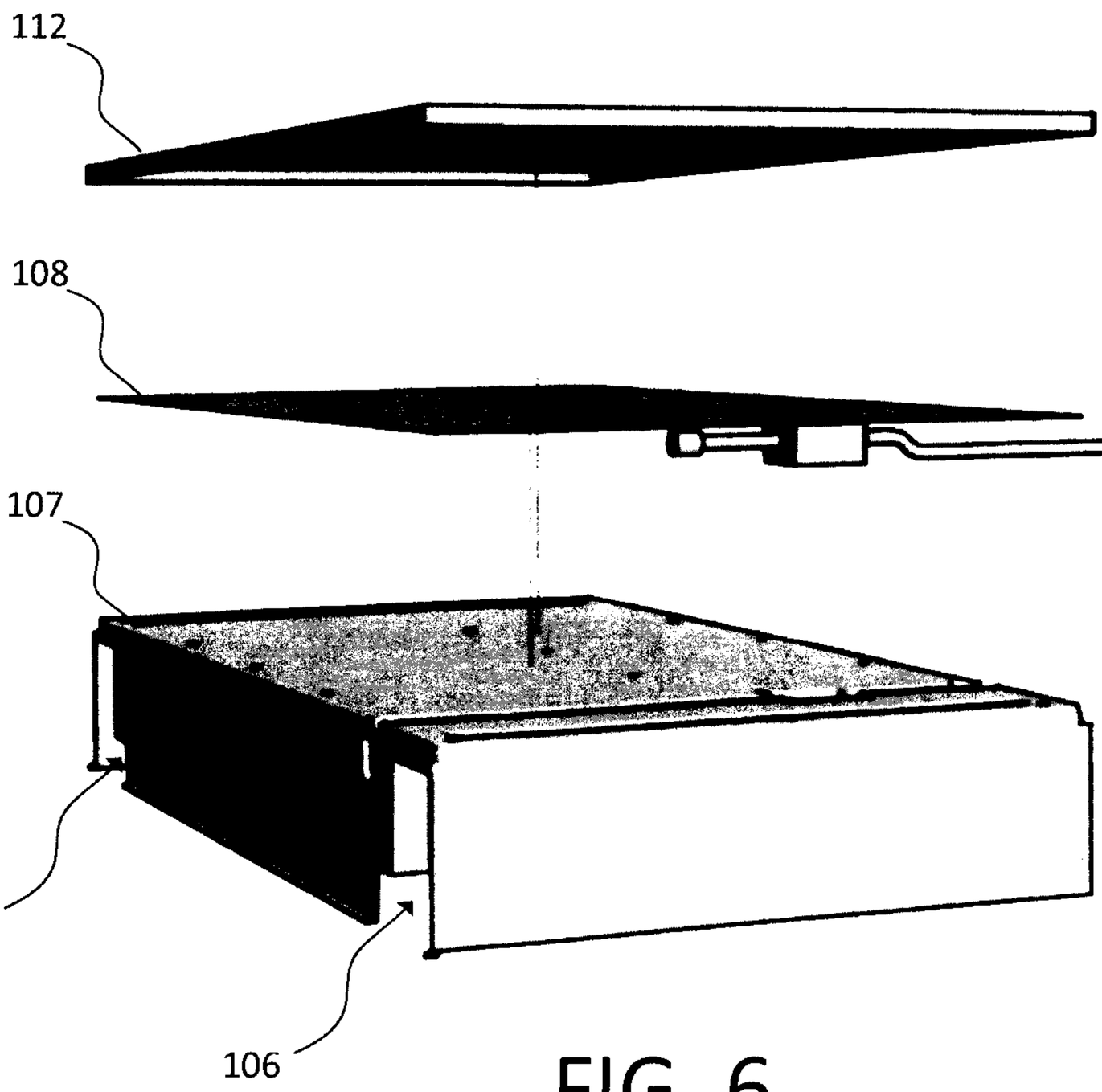


FIG. 6

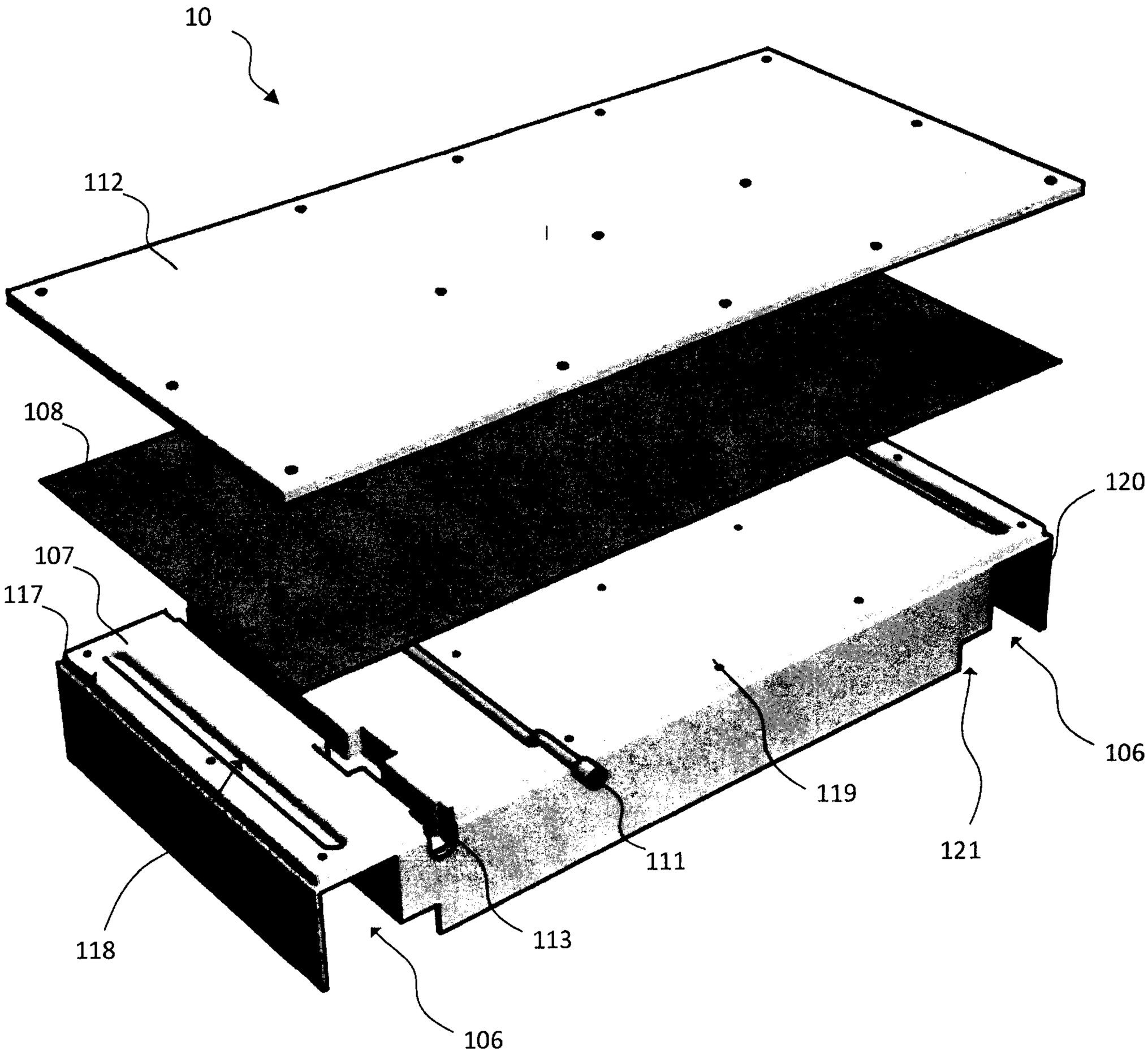


FIG. 7

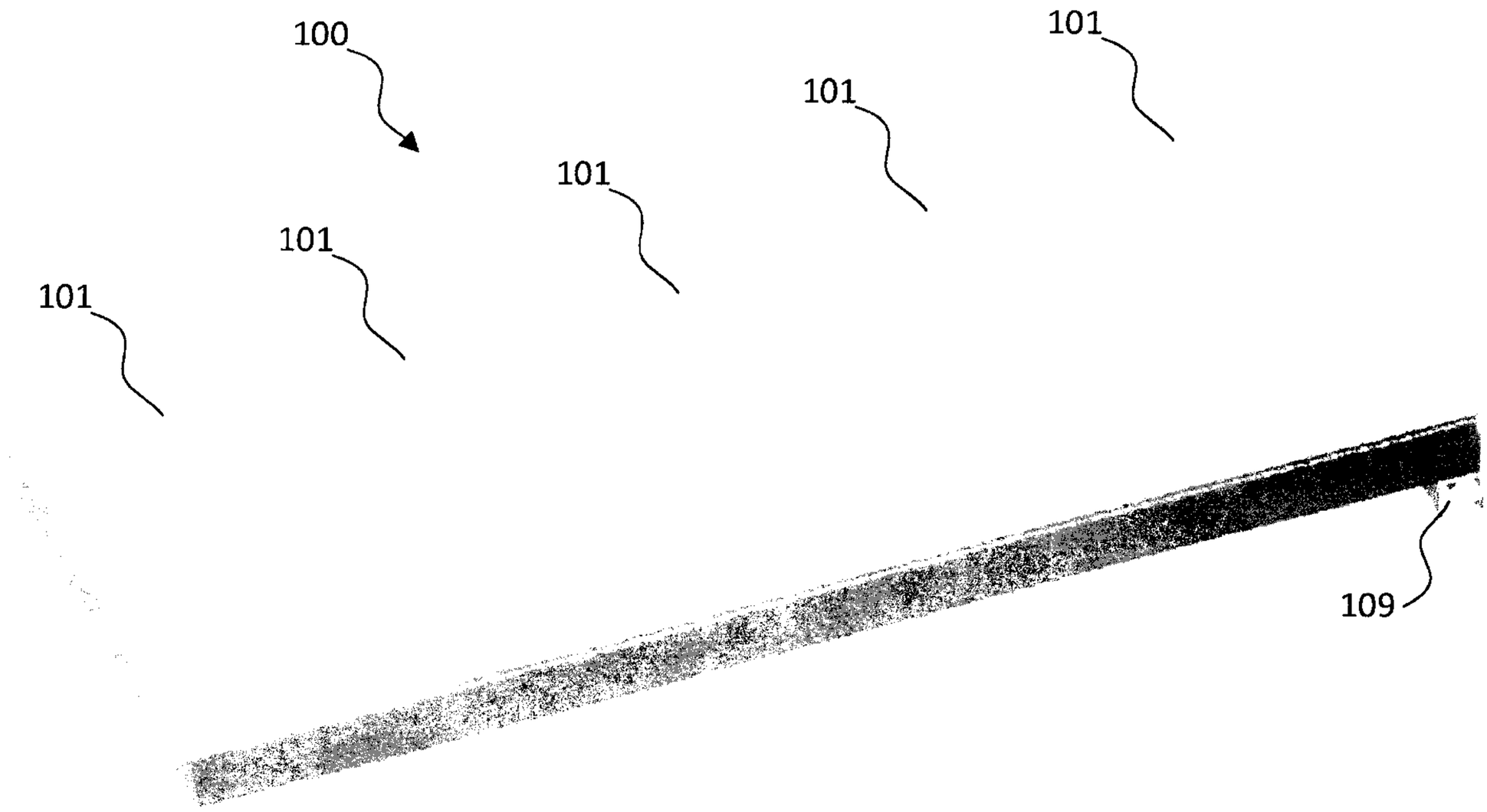

100
101
101
101
101
101
101
109

FIG. 8

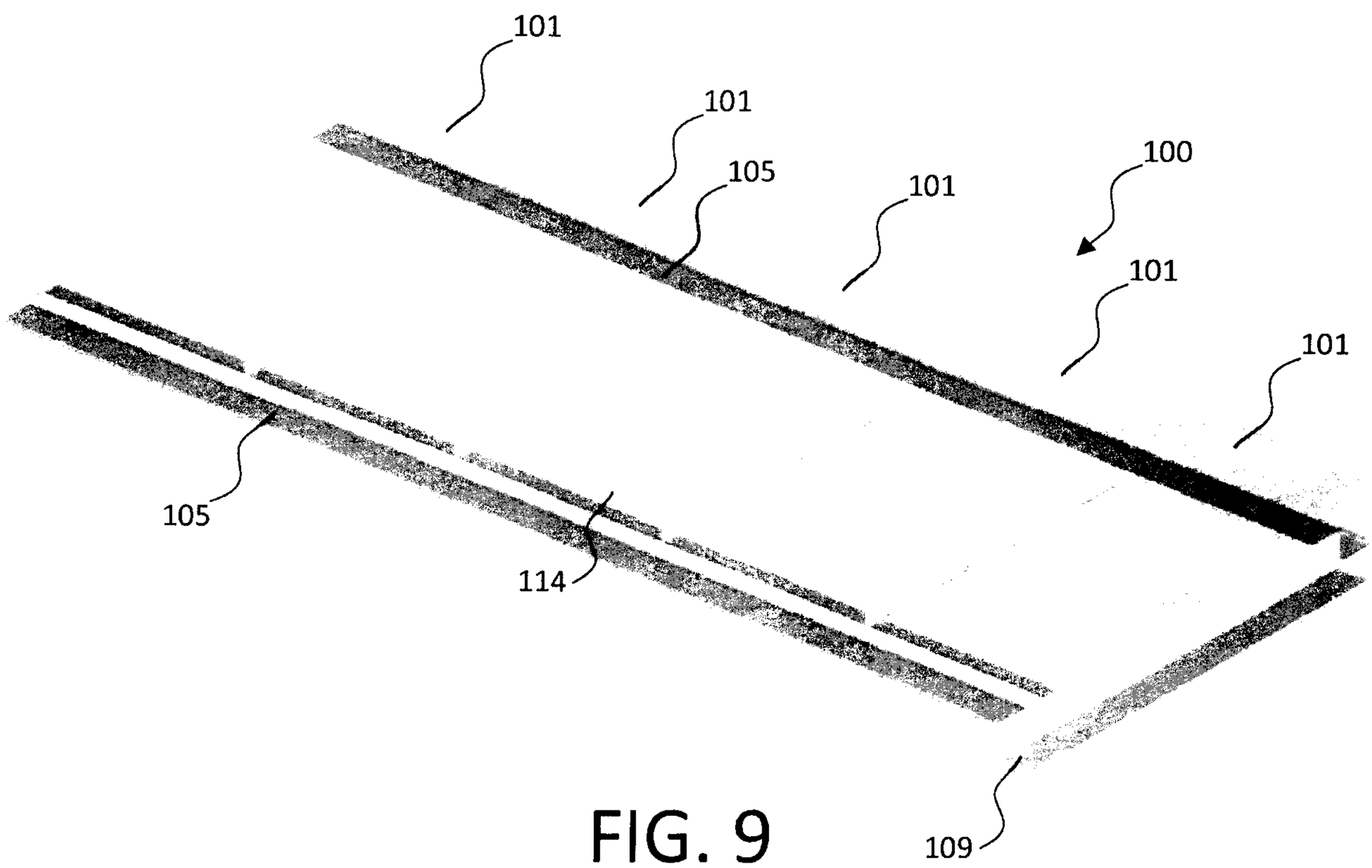

101
101
105
101
100
101
101
105
114
109

FIG. 9

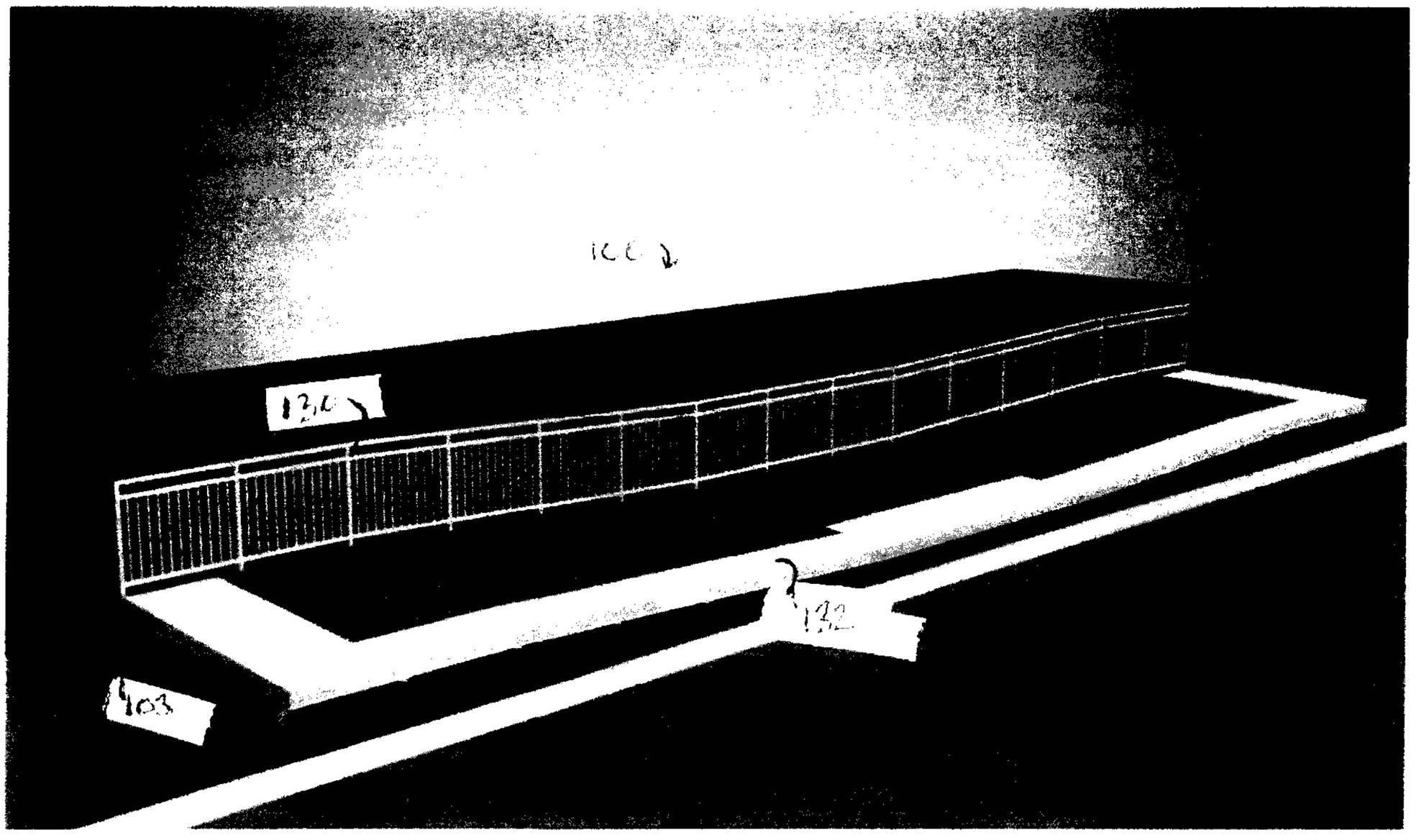


FIG. 10

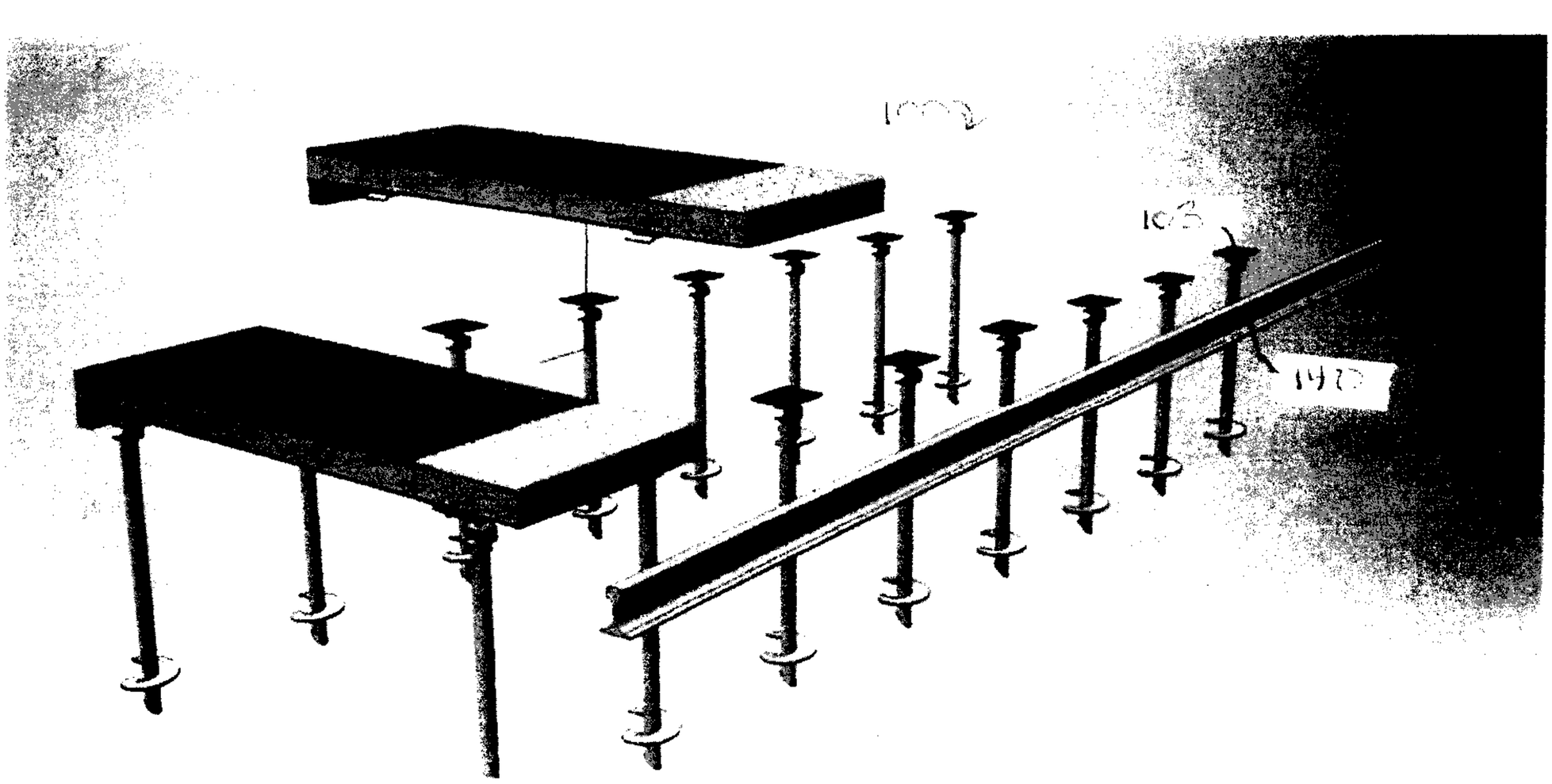


FIG. 11

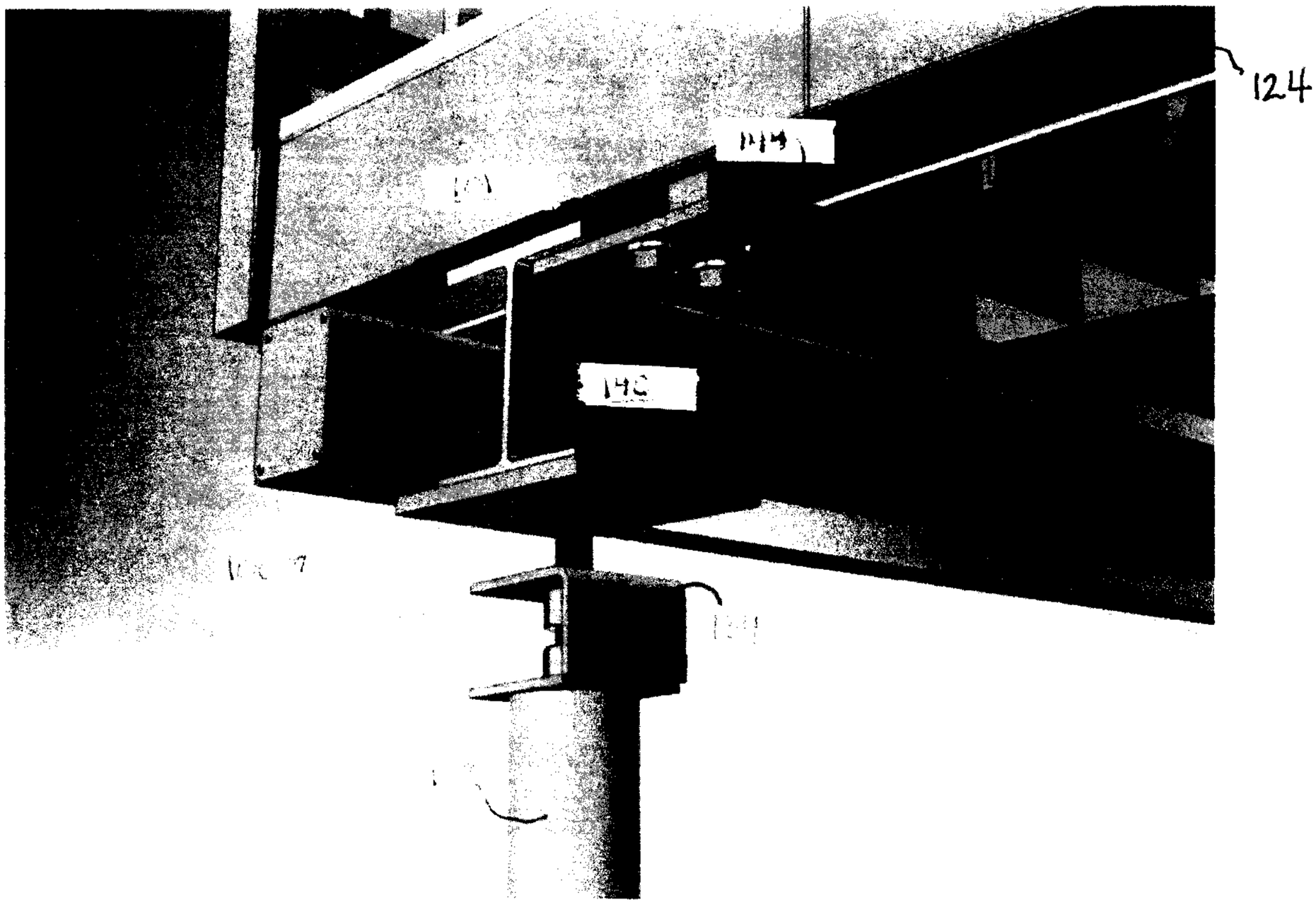


FIG. 12

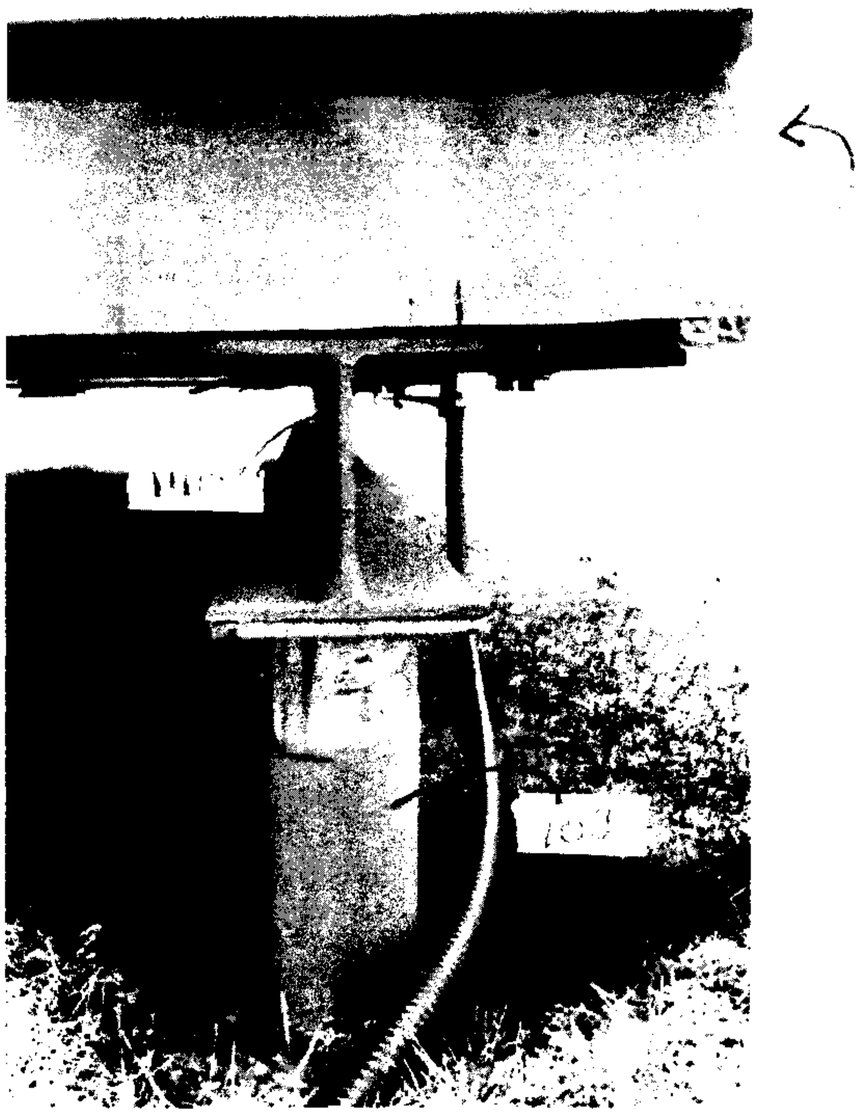


FIG. 13

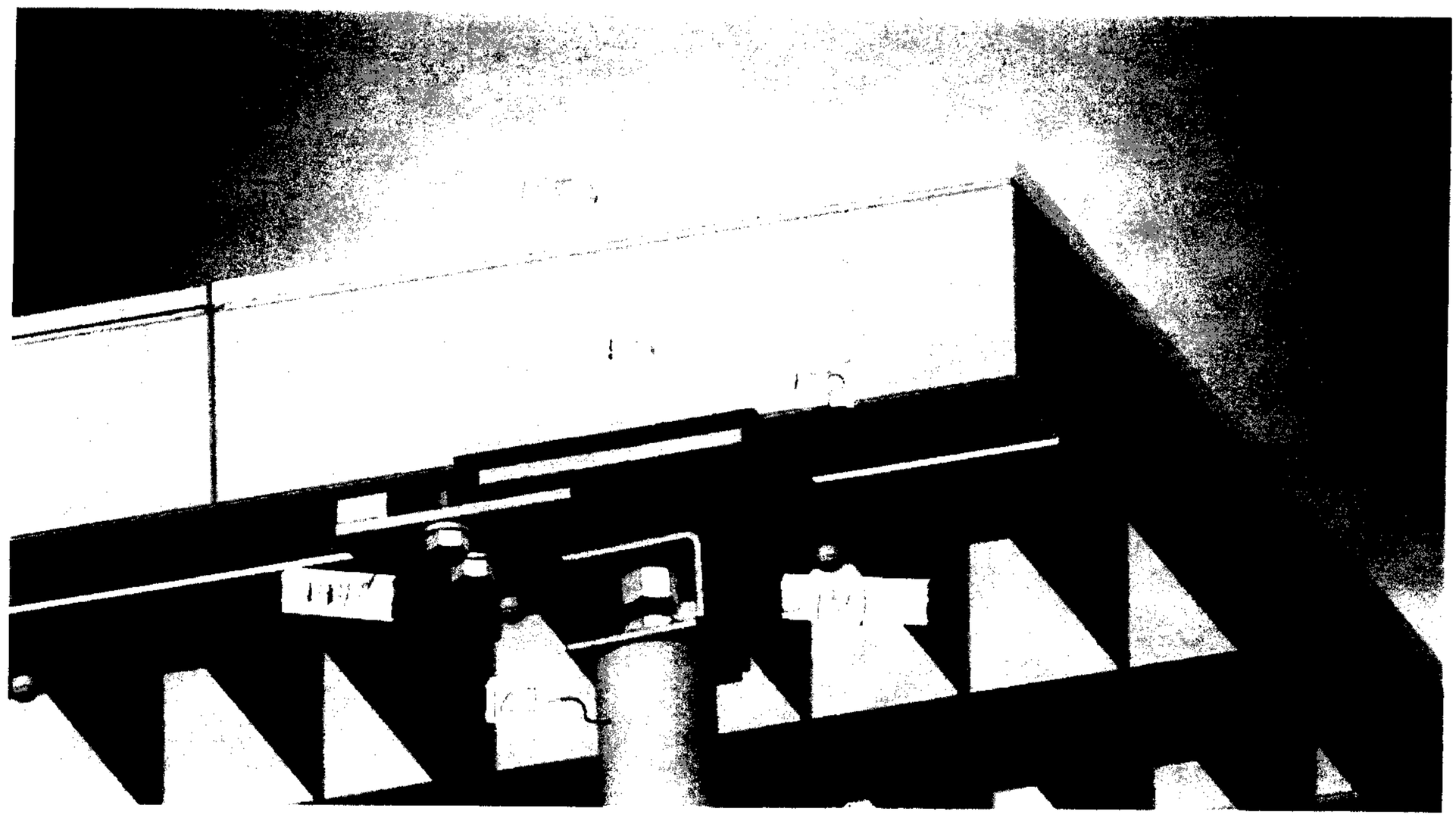


FIG. 14

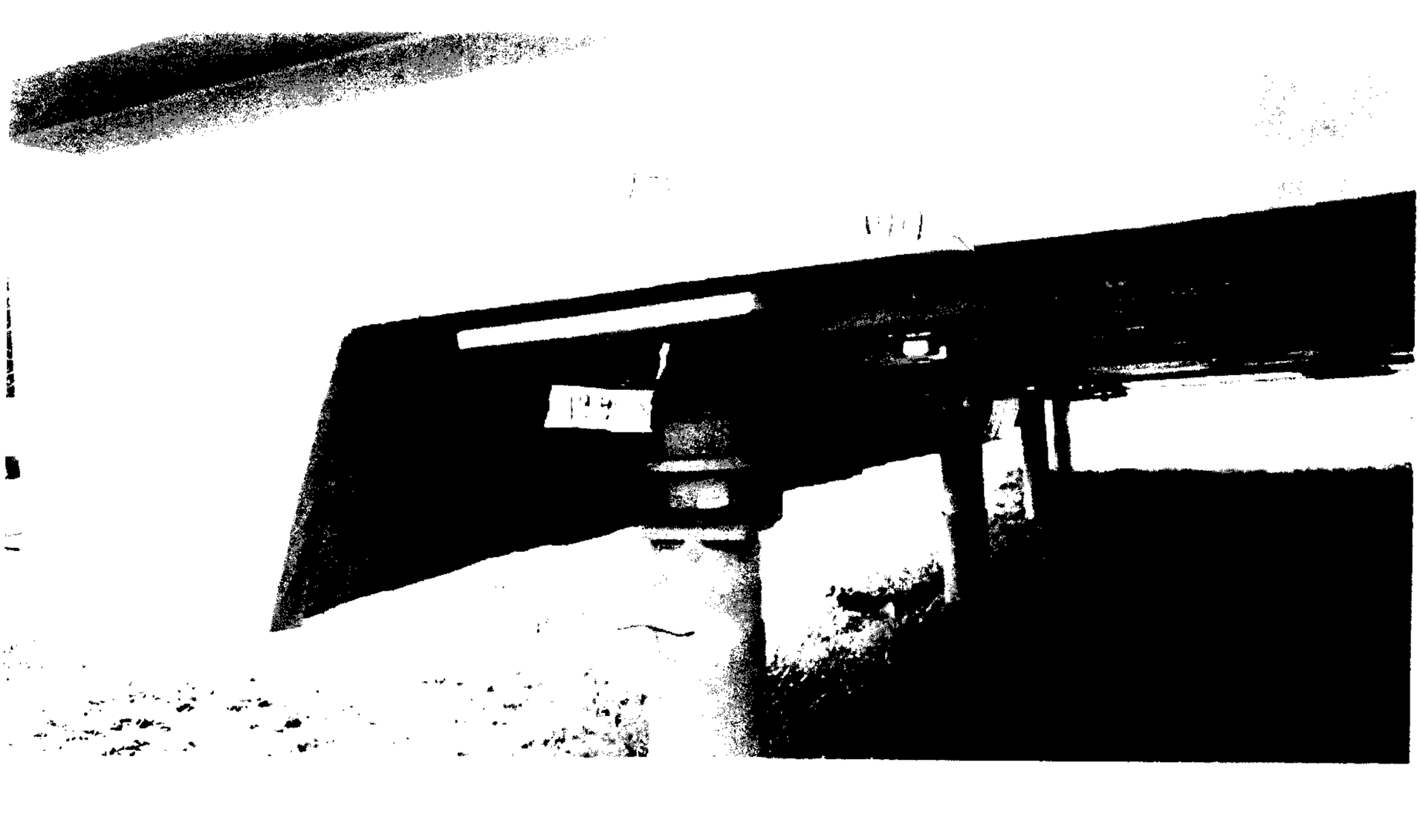


FIG. 15

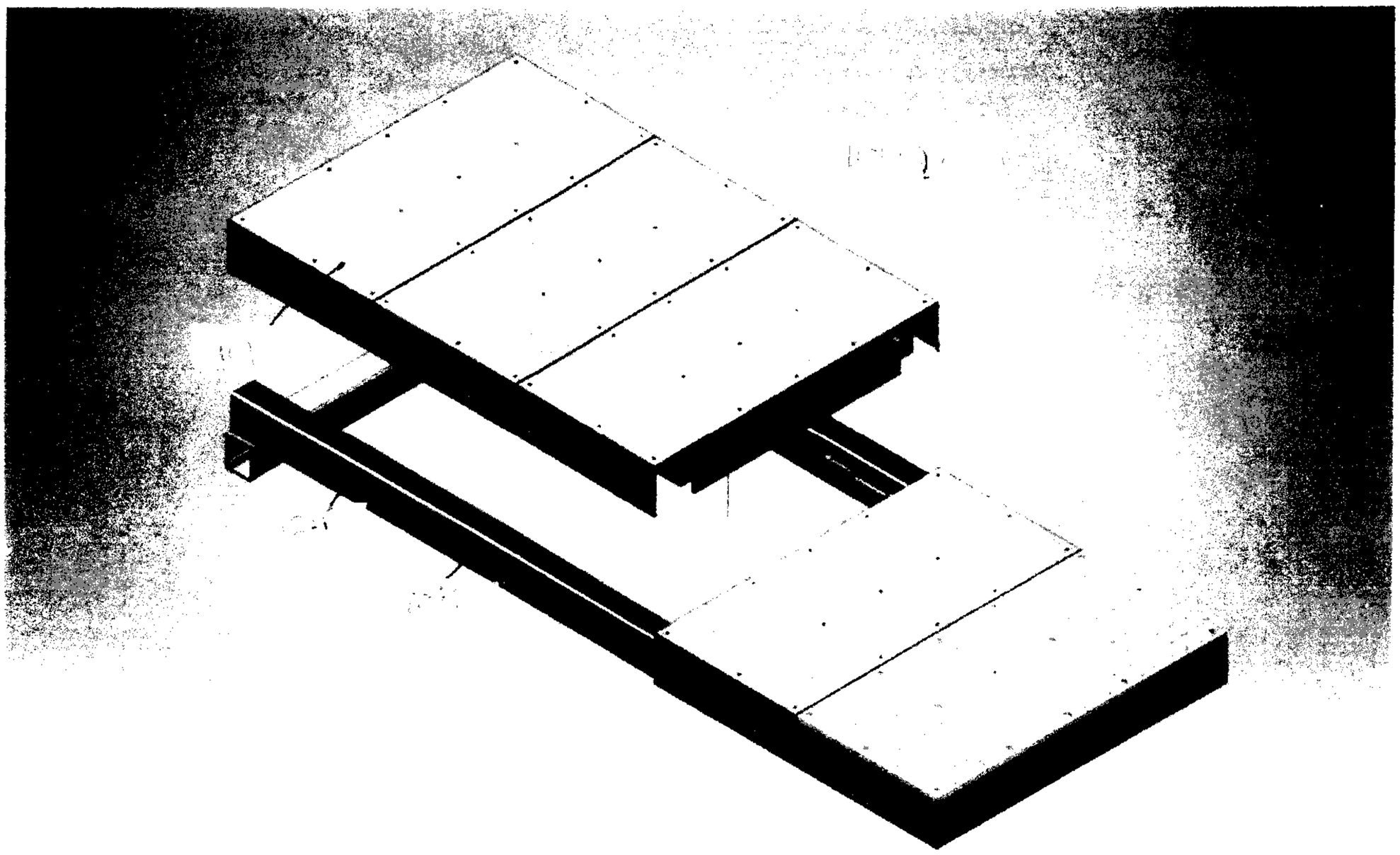


FIG. 16

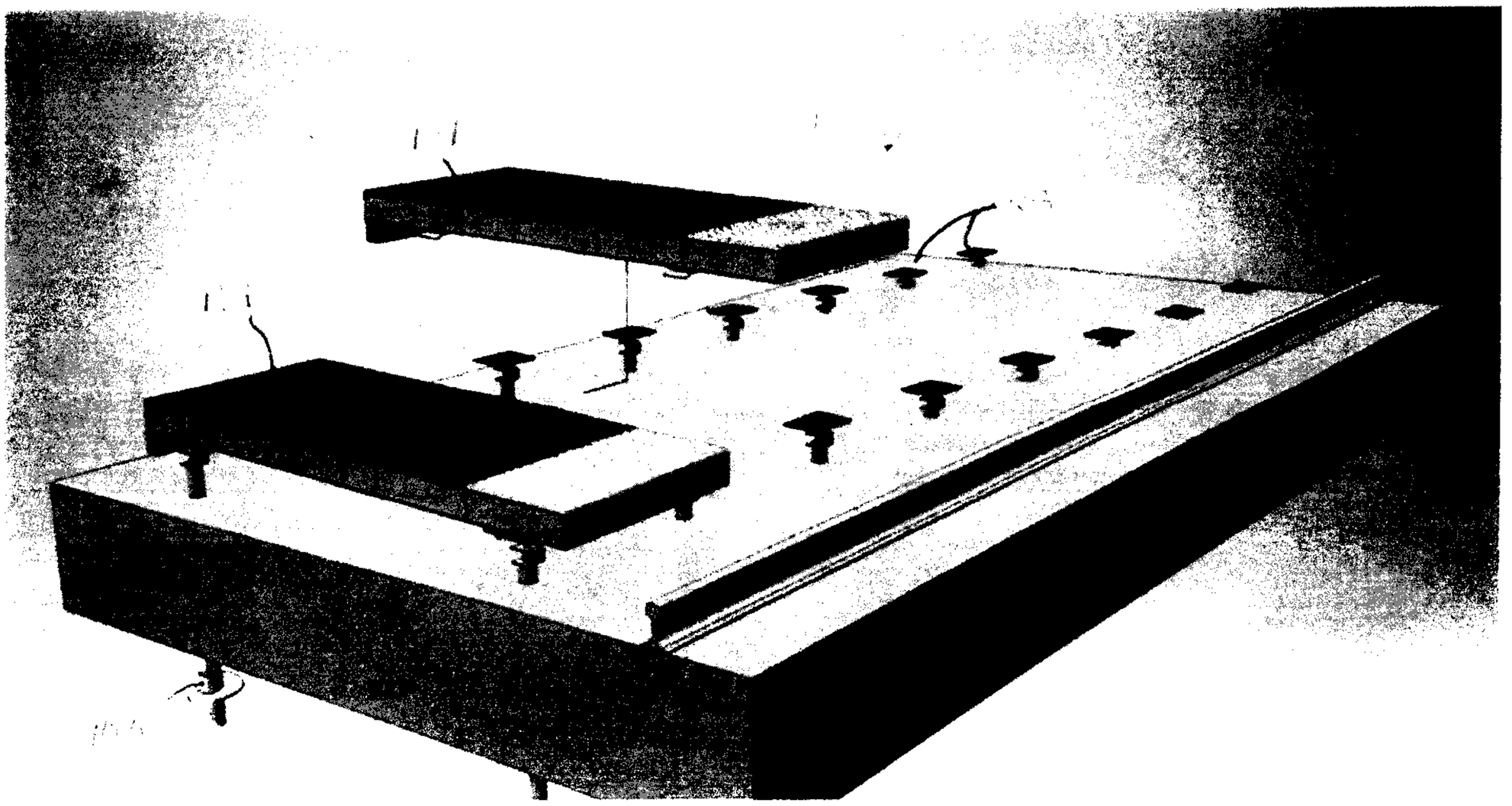


FIG. 17

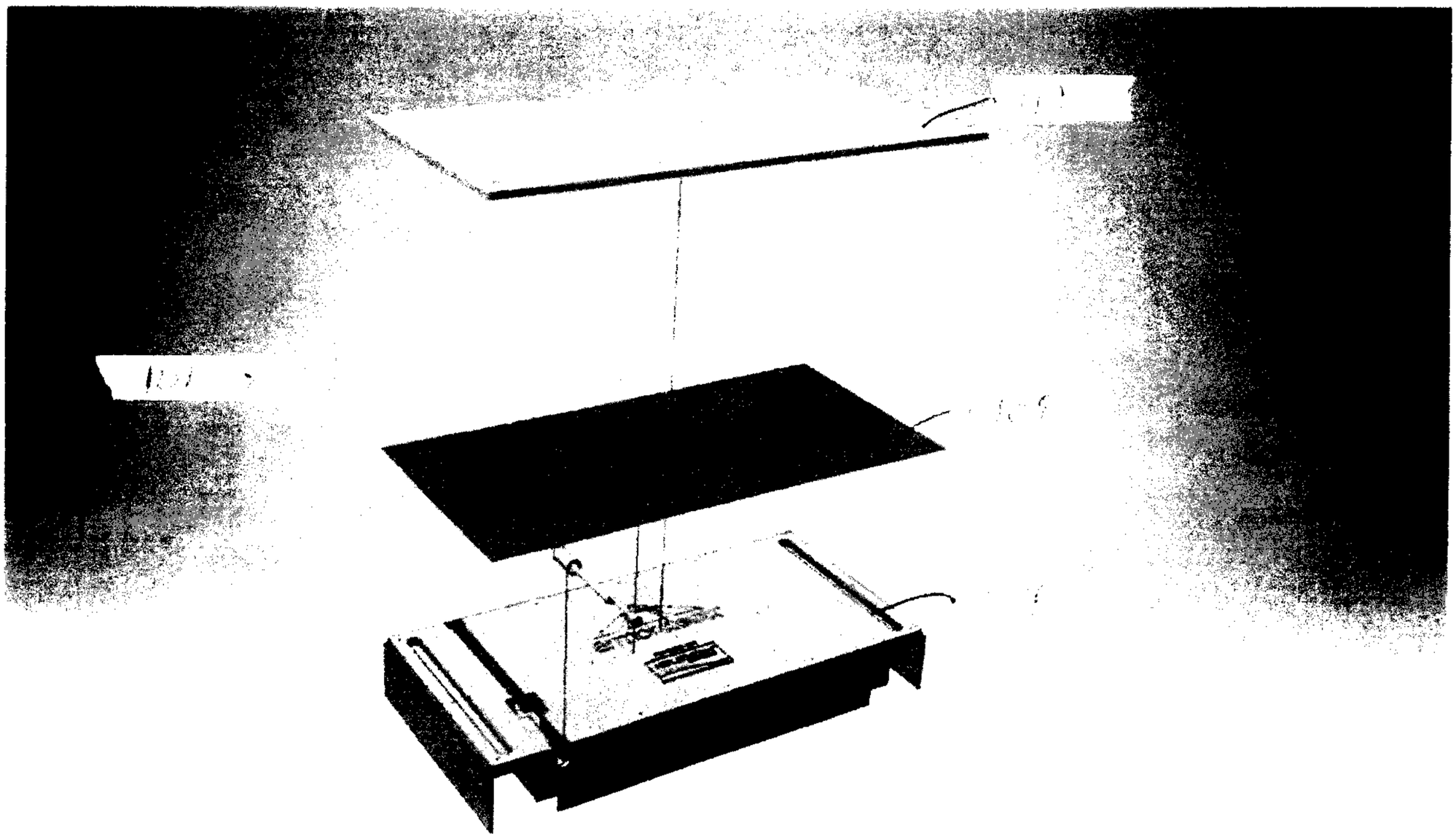


FIG. 18

FIG. 19

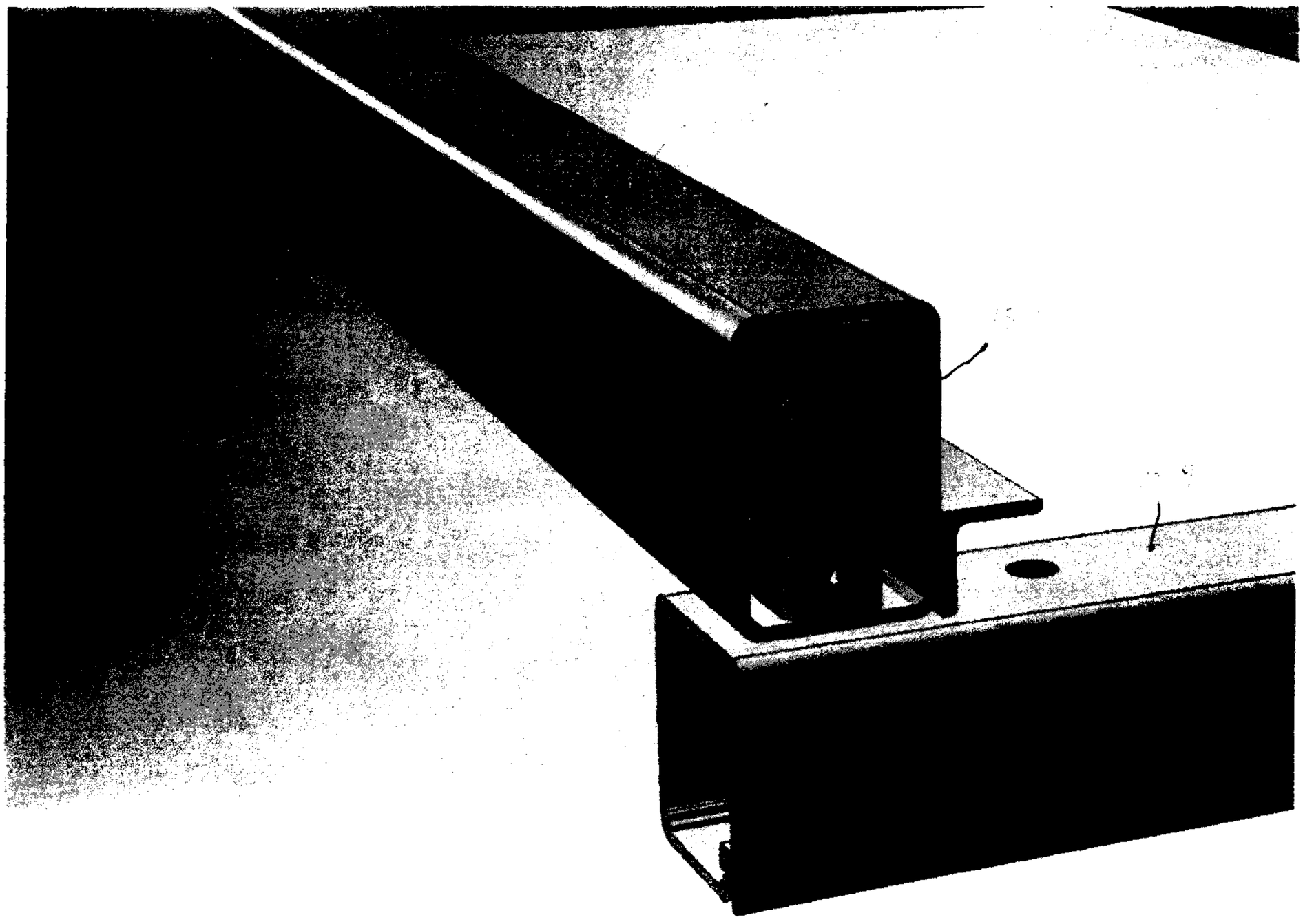


FIG. 20

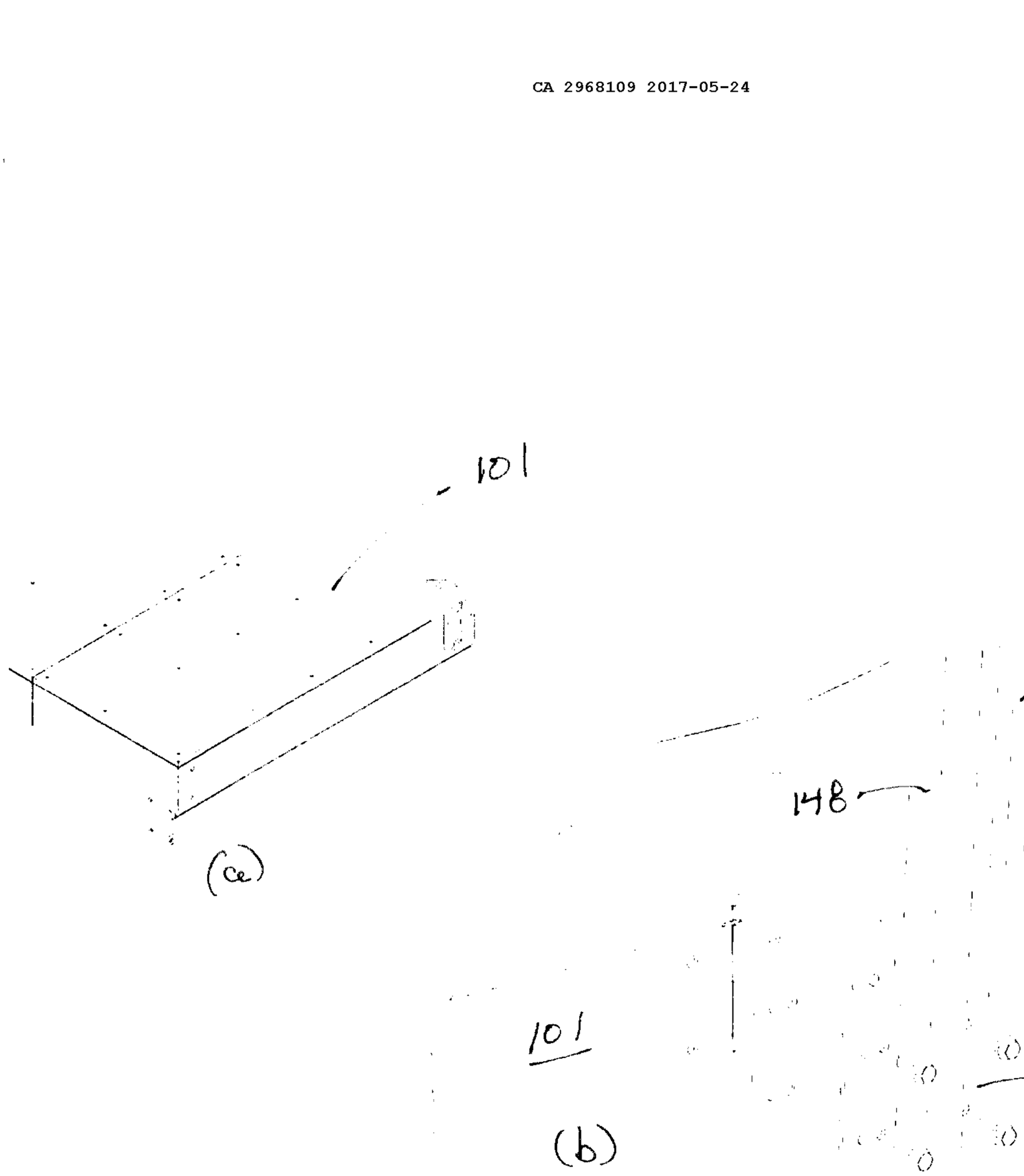


FIG. 21

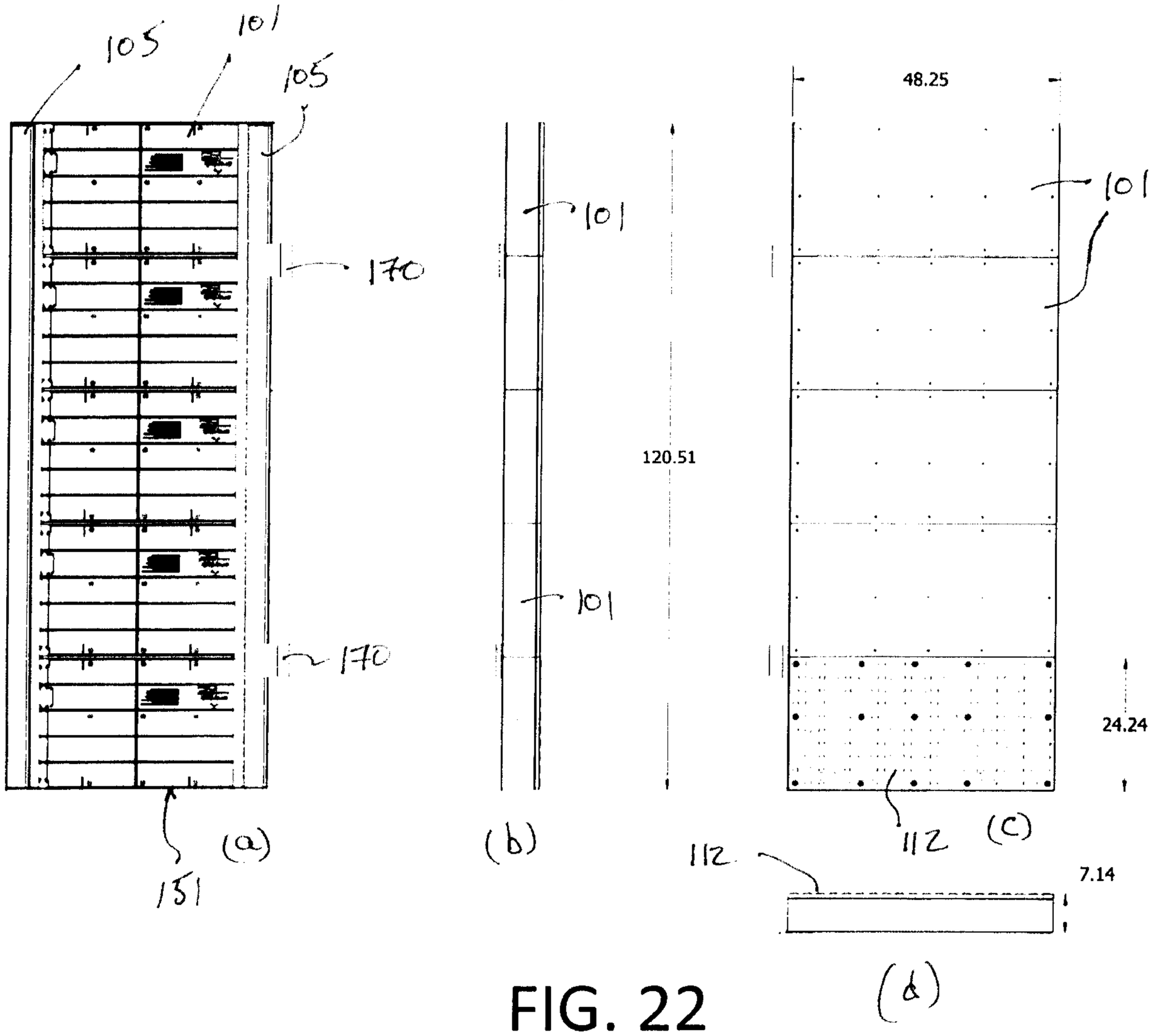
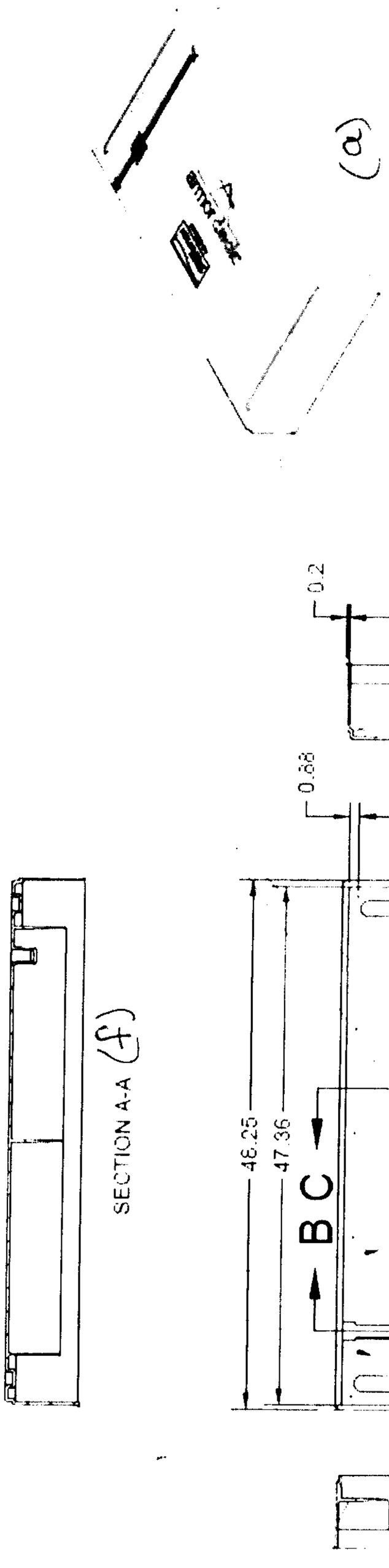

105
101
105
170
170
151
(a)
48.25
101
101
120.51
101
(b)
112
112
(c)
24.24
7.14
(d)

FIG. 22


(a)
0.2
24
0.88
(e)
SECTION C-C
SECTION A-A
(f)
48.25
47.36
B C
A
13
8
0.88
12
9.6
9.6
14.4
0.88
(b)
SECTION B-B
(d)

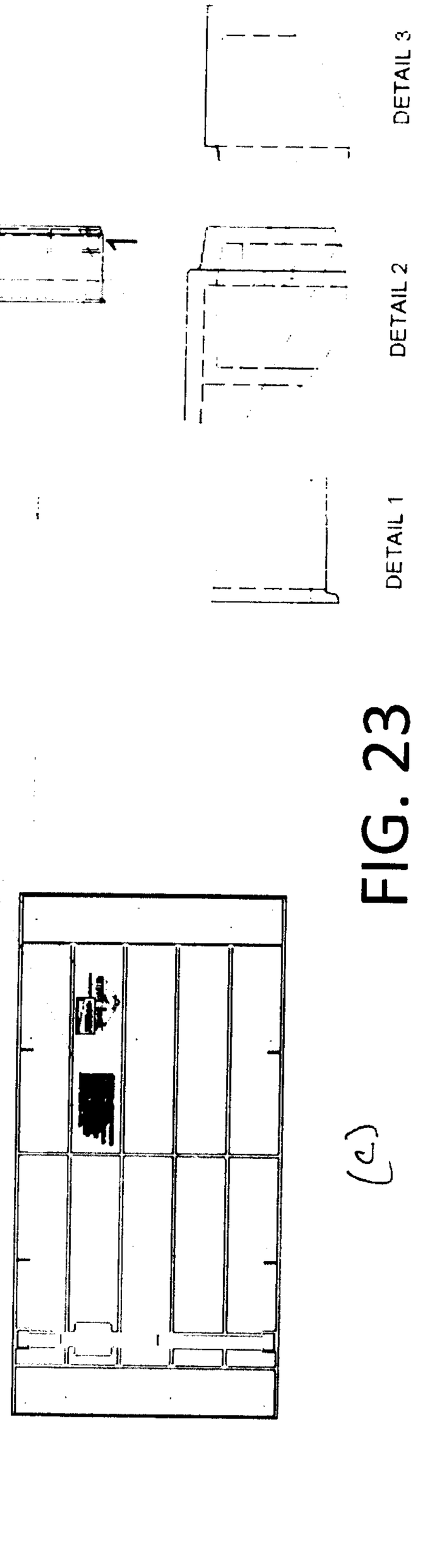

2
1
3
DETAIL 3
DETAIL 2
DETAIL 1
(c)

FIG. 23