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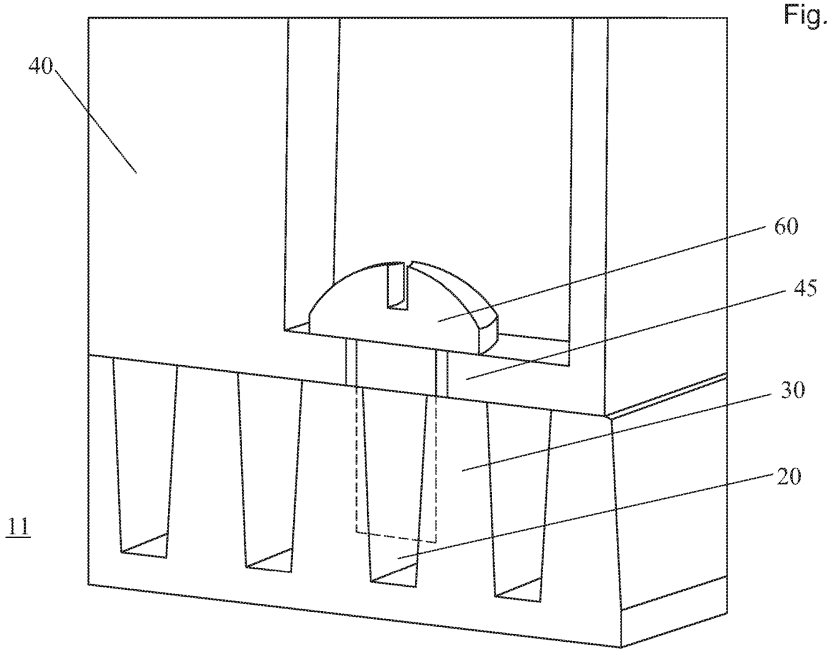
(56) Documents Cited:
GB 2453764 A **EP 0617651 A**
CN 102990438 U **DE 019531592 A**
FR 002741119 A **US 5224307 A**
US 4555749 A **US 20080232065 A**

(58) Field of Search:
INT CL **H02B, H05K**
Other: **EPODOC, WPI**

(54) Title of the Invention: **Mounting surface**
Abstract Title: **MOUNTING SURFACE**

(57) A surface 10 for mounting lighting electronics components 40 comprising: grooves 20 in the surface, the grooves being suitable for receiving fasteners such as screws 60, the fasteners being used to attach components to the surface 10. The grooves 20 may be tapered along their depth or tapered along their length. The width of the groove may increase or decrease with depth. The grooves may be parallel and equally spaced. The surface may take the form of a board or tray. Machine readable maps or instructions are also provided to enable a 3D printer to manufacture the surface.

Fig. 7



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

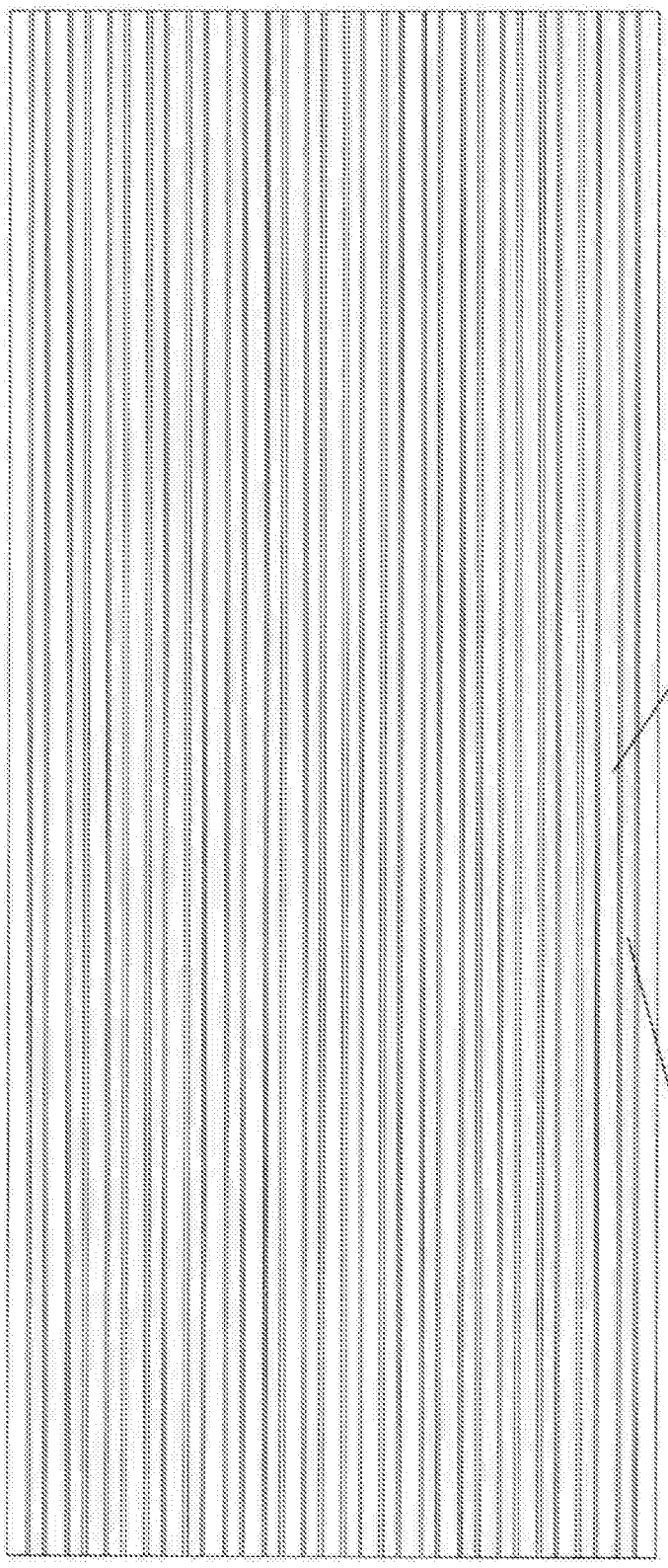
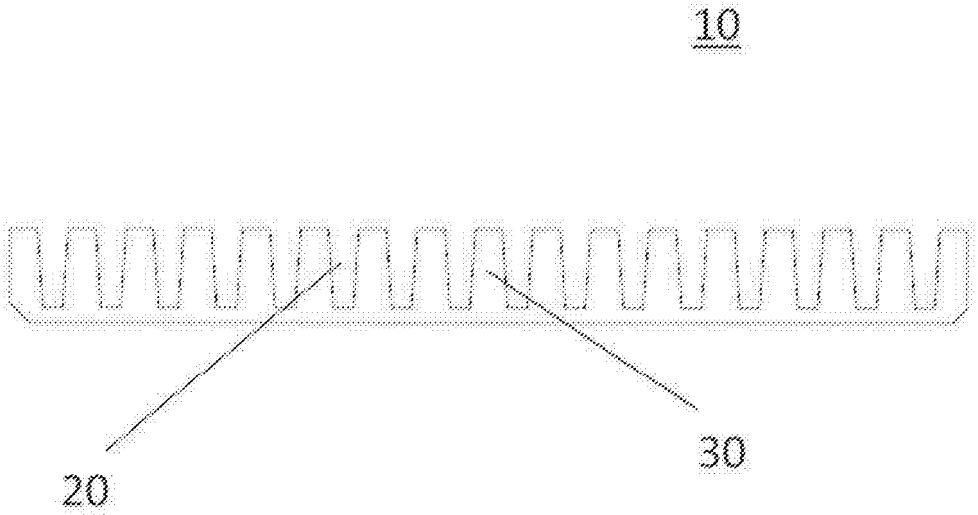


Fig. 1

Fig. 2



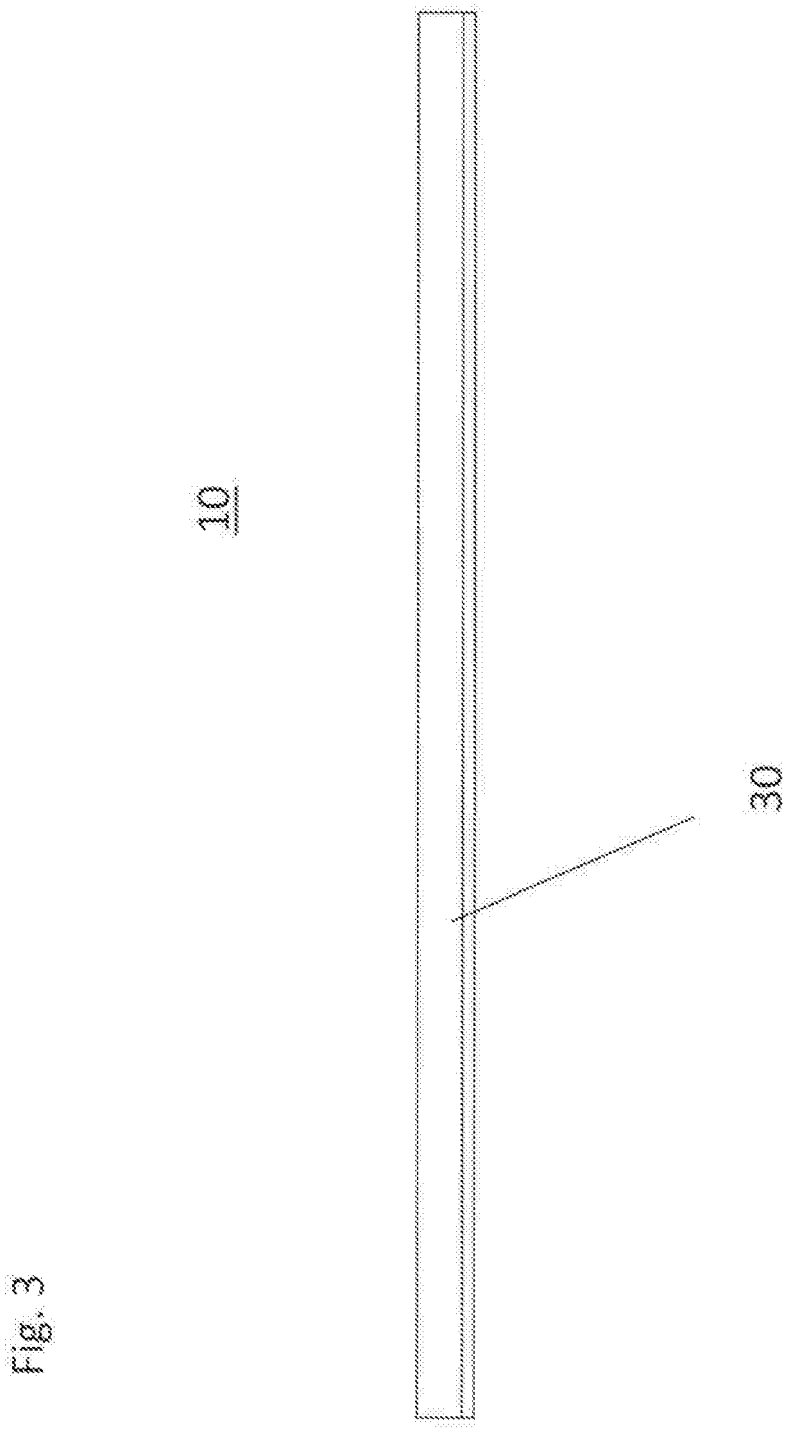


Fig. 3

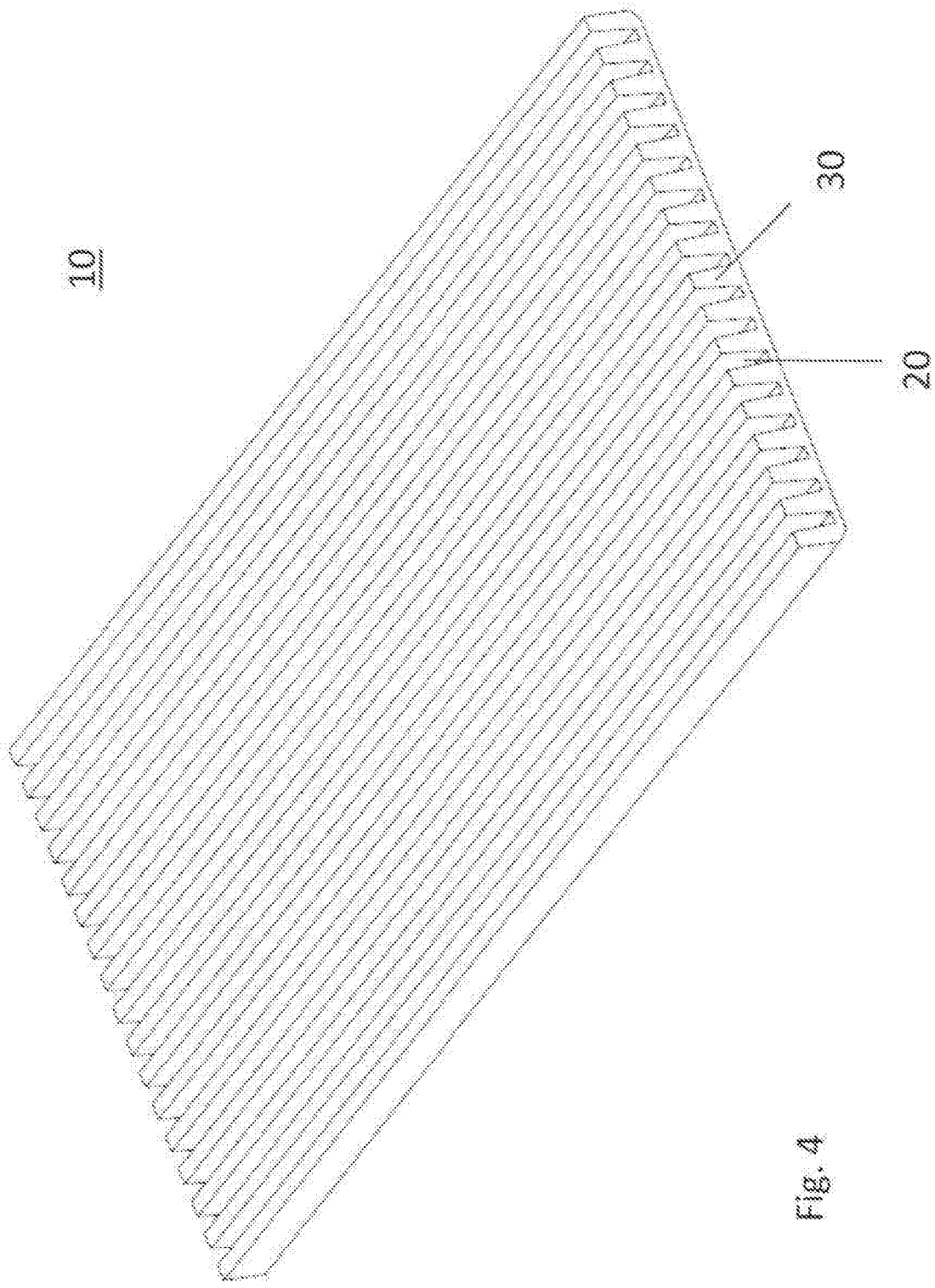
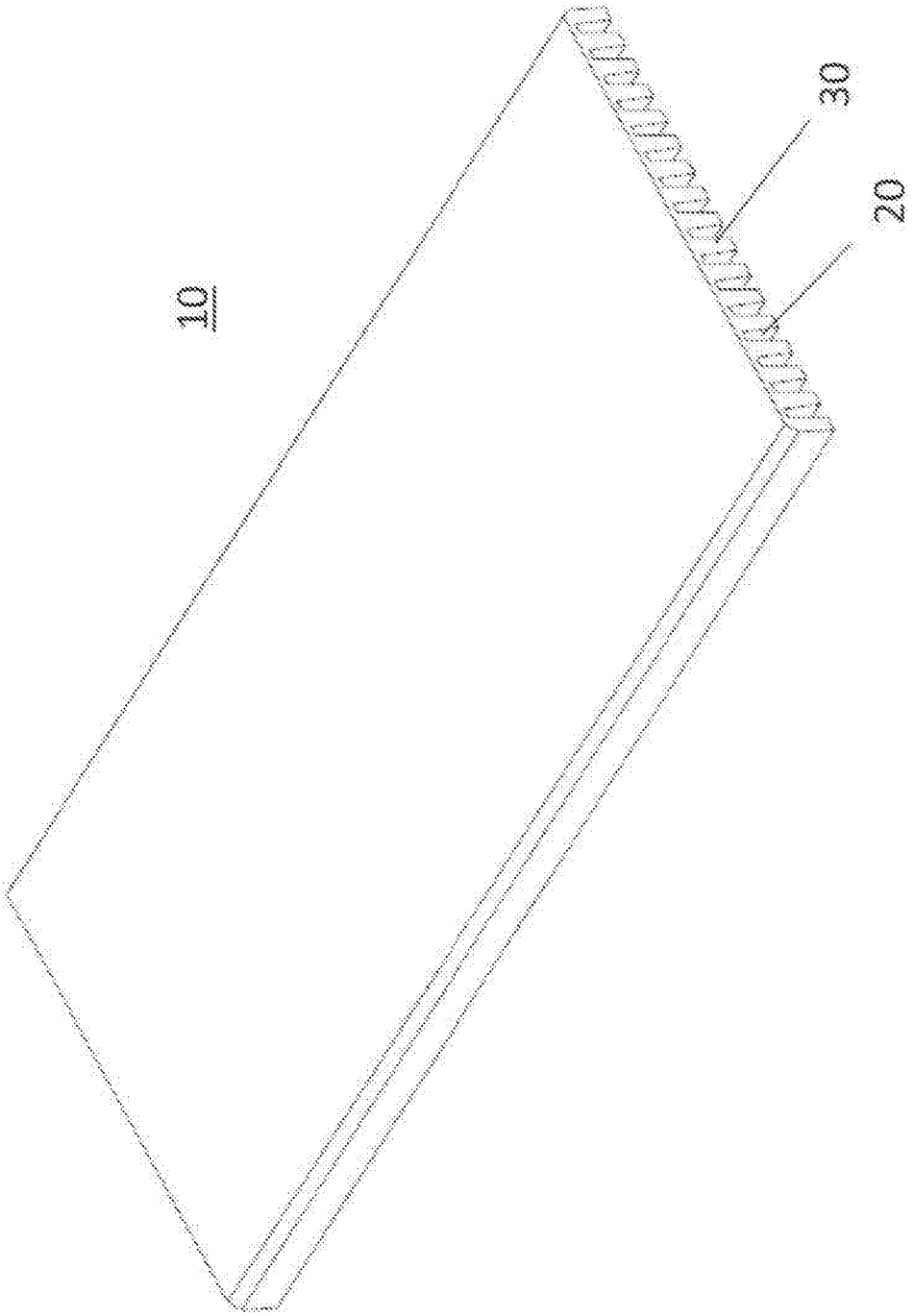


Fig. 4

Fig. 5



17 07 15

Fig. 6

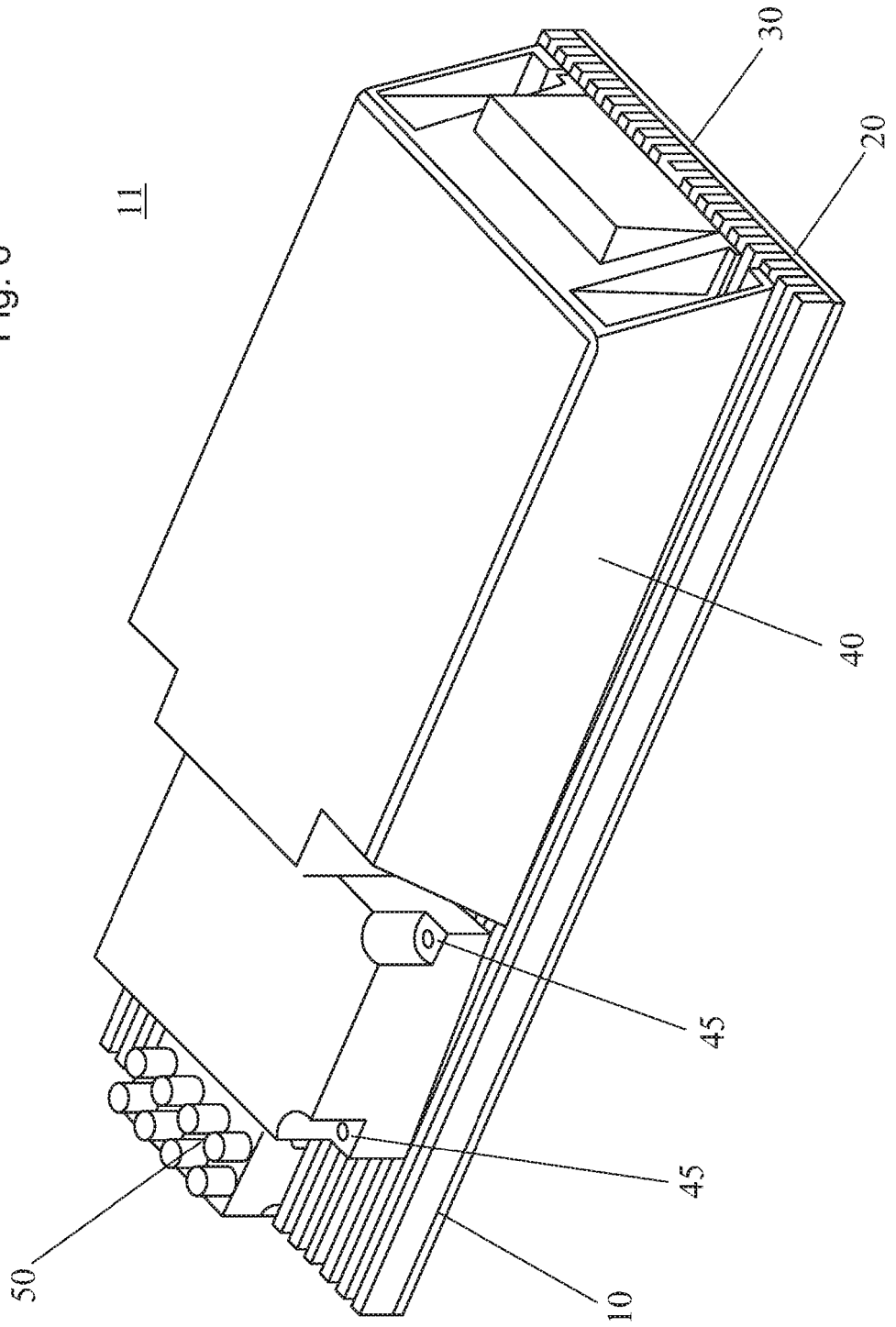


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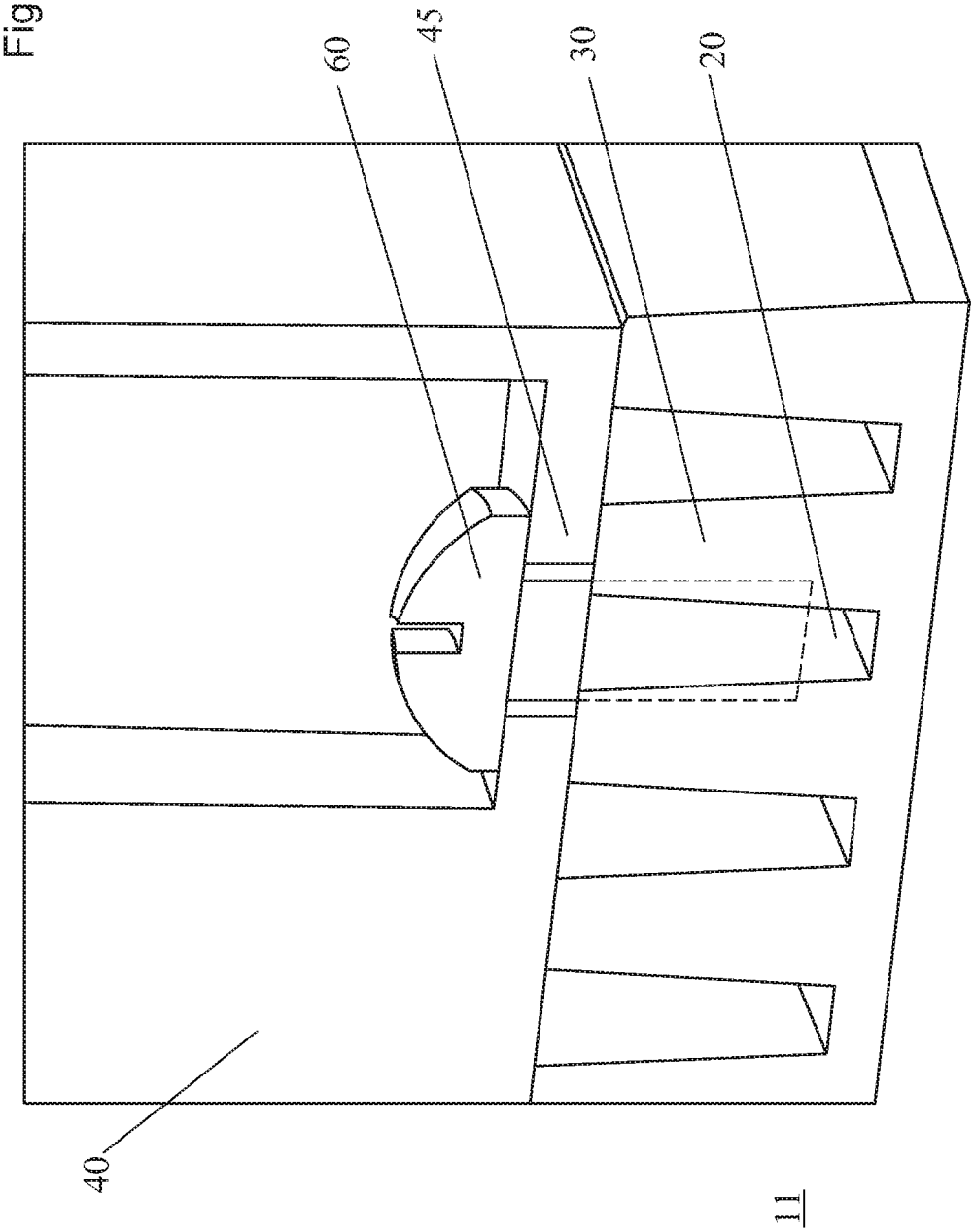
Fig. 7



MOUNTING SURFACE

The present invention relates to means for securing components to surfaces. More particularly, the present invention relates to an arrangement for the flexible mounting of a range of electronic components on a surface such as a tray or board.

In many applications, such as in LED lighting, electronic components comprise a power source and circuitry, such as a PCB, encapsulated in a plastic casing. Screws are often used to secure these components to a backing plate, which may be part of a larger casing or supporting frame. The screws pass through holes in or around the plastic casing and then through holes made, typically drilled, punched or extruded, into the backing plate, and the screws can mate with nuts or may screw into the holes drilled into the backing plate in order to secure the electronic component to the backing plate.

Using this arrangement, the components can be fixed in place using screws but, should the component need to be removed for replacement or repositioning, the component can be moved simply by removing the screws, allowing it to be removed from the board. As components come in a wide range of shapes and sizes, many different screw holes must be made into the backing plate to enable use of a variety of different components with a particular backing plate. Provision of many suitably-placed screw holes allows one backing plate to align with the screw hole positions used to secure a variety of components. Use of so-configured backing plates increases the complexity of manufacture, however, and may still not allow a backing plate to be used with all components as it may not be possible to provide a suitable arrangement of holes to cater for all variations in screw configuration. Where a large number of screw holes are provided on a backing plate, it is possible that a user of the backing plate may become confused as to the optimal placing of a component or whether a particular component can be attached to the backing plate.

In particular, in lighting applications, LED lighting often requires the provision of LED driver electronics within the lighting housing. Different LED lights often require different driver electronics components, these components having different sized dimensions and mounting requirements. This leads to a situation where a standardised lighting housing is designed to allow a variety of alternative LED lights and respective driver electronics within the same lighting housing. To enable the different driver electronics components to fit in the housing, the backing plates within the housing must be provided with a hole configuration that allows each of the different driver electronics

components to be attached to the backing plate. This requires a designer to review the possible alternative driver electronics components to ascertain the locations of the screw holes on the components and to design a hole configuration on a backing plate that can allow the different driver electronics components to be fitted to the backing plate.

The present invention seeks to provide a more flexible solution that seeks to mitigate or avoid the disadvantages mentioned above.

According to a first aspect, there is provided a surface for mounting one or more lighting electronics components that may be secured using fasteners comprising: one or more grooves in the surface; wherein the grooves are suitable for receiving the fasteners in order to attach one or more components to the surface.

The one or more grooves provide the ability to secure a range of different sizes of components to a surface without the need for many different patterns of screw holes to be chosen and provided in a surface. Suitable components could include, for example, LED drivers. Optionally, the fasteners used can be screws which tap, or engage, into a groove.

Optionally, the surface further comprises a plurality of grooves.

By providing a plurality of grooves, a greater range of sizes of components can be mounted on the surface as the components can be positioned on the surface with more flexibility in orientation. Additionally, the manufacture of such a surface may be easier when providing multiple grooves.

Optionally, the surface further comprises tapered grooves.

By providing tapered grooves, or variable-width grooves along an axis of the grooves, a range of sizes of fastener can be used with the grooves because a fastener can engage with a groove at different points along the taper.

Optionally, the surface further comprises grooves that are tapered along the depth of the groove. Optionally, the width at the opening of the groove is larger than the width of the groove at the deepest point of the groove.

By providing grooves which are tapered with depth, a range of sizes of fastener can be used at the same place on the groove, because each size of fastener, or screw, may engage, or tap, into the groove at a different depth.

Optionally, the surface further comprises grooves which are arranged to be substantially parallel. Optionally, the surface further comprises grooves which are arranged to be equally spaced along their length.

By providing grooves which are substantially parallel, or equally spaced-apart along their length, a regular pattern of grooves is produced that either allows a greater

range of sizes of components to be used with the surface, or alternative positioning of a range of components on the surface, or both.

Optionally, the surface takes the form of the board.

By providing a surface in the form of a board, the board may be further attached to another surface or object, for example, a supporting frame.

According to an alternative aspect, there is provided a surface for mounting one or more lighting electronics components that may be secured using fasteners comprising: one or more grooves in the surface; wherein the grooves are suitable for receiving the fasteners in order to attach one or more components to the surface.

Embodiments will now be described, by way of example only and with reference to the accompanying drawings having like-reference numerals, in which:

Figure 1 is a plan view of a first embodiment;

Figure 2 is a side view of the first embodiment of Figure 1;

Figure 3 is an alternative side view of the first embodiment of Figures 1 and 2;

Figure 4 is a perspective view of the first embodiment of Figures 1 to 3;

Figure 5 is an alternative perspective view of the first embodiment of Figures 1 to 4;

Figure 6 is a perspective view of the first embodiment of Figures 1 to 5 shown in use with components mounted; and

Figure 7 is a sectional view of the arrangement shown in Figure 6.

With reference to the apparatus shown in Figures 1 to 5, a first embodiment will now be described.

According to a first embodiment, there is provided a mounting tray or board 10 formed with a series of parallel grooves 20 on one surface of the board 10, the grooves 20 being formed along one axis of the surface of the board 10. Each groove 20 is separated from the neighbouring grooves 20 by an equal distance along their length, forming a ridge 30 between each of the grooves 20. Each of the grooves 20 extend from one end of the board 10 to the other end of the board 10. The grooves 20 are tapered in depth, such that the lower portion of each groove 20 is narrower in width than the top portion of each groove 20. This tapered arrangement allows for thinner diameter screws to tap into the walls of the groove 20 at different portions of the walls of the groove 20 to relatively thicker diameter screws.

Typical dimensions for a mounting tray of the first embodiment can be 240mm by 99mm with a depth of around 10mm, having grooves 20 that are approximately 6 to 8mm deep. These dimensions are for illustration only and it will be understood that a

range of different dimensions for each of these dimension values, and a variation of the ratio between the example values listed above, is possible. The grooves can be designed with dimensions that can accommodate a specific range of screw sizes or a single screw size.

The grooves can be provided in alternative configurations to that of the first embodiment, for example the grooves need not be parallel to each other and can provided in many alternative arrangements and still provide a range of points at which screws can be used to fasten components to a board provided with grooves. All of these arrangements of one or more grooves will typically provide one or more grooves that allow a plurality of points, at which to fasten screws into the grooves, along the one or more grooves, thus allowing the fastening of screws at multiple points on the surface of a board in which grooves are provided.

The grooves can be provided in the surface of the board in several alternative arrangements, not limited to: an arrangement having a regular sequence of grooves along a line on the surface of the board, where one or more sequence of grooves along an axis are provided and where the sequences of grooves can be parallel; or a set of grooves of a set length, or of a varying length, where the grooves are disposed over a surface in a non-parallel arrangement. The grooves need not be straight and can be provided as, for example, oscillating lines across the surface of the board.

As screw holes on electronics components are usually arranged in a substantially rectangular fashion, at the corners of a component, and the components themselves will typically tend to be large enough to cover an area over which multiple grooves are provided on a surface, positioning a component at an angle relative to the axis of a set of parallel grooves 20 would allow a component having four screw holes to be securely mounted on the board 10 by four screws fastened into points along up to four different parallel grooves. Where a component does not have a regular arrangement of screw holes, or is provided with a greater or lesser number of screw holes, it should still be possible to position the component over the grooves to align the grooves with the screw holes provided on the component in order to fasten screws through the screw holes into the grooves.

The thickness of the grooves may vary where, for example, the board needs to accommodate a component or components that have different sized screws (which will not fit in a single-width groove). To accommodate such a component or components, the thickness of the grooves can vary from one end of the groove to the other end, widening along the length of the groove, or it can vary along the length, for example, by oscillating

between two widths along the length of the groove.

The grooves extend the whole way along the board to maximise the total mounting area available, but it will be appreciated the board may have sections along its lengths where the grooves are not present, for example to allow for the presence of extremely non-standard components that would not fit on the groove arrangement as these may require alternative fastening means to be provided on the board, or where components are glued to the board, or where connections, supports or mounting points are provided to connect the board to other surfaces or structures. In this case the groove pattern is interrupted, and can continue after the section without grooves.

The tapering of the grooves can be altered such that the grooves could have walls at 90° to the surface and bottom of the groove, thus having a square or rectangular cross-section, or the grooves can have walls disposed at an angle between 45° and 90°. The tapering of the grooves can be varied along the length of the groove, or remain constant along the length of the groove.

Figure 6 shows a mounted assembly 11, where a mounting board 10 has an electrical component 40, a second electronic component 55, and a screw terminal 50 mounted thereon. The assembly 11 is arranged such that, in use, the second electronic component 55 is positioned such that most or all of its screw holes 45 align with the grooves 20 of the mounting board 10, allowing the component 55 to be mounted to the mounting board 10 by engaging the screws 60 with the grooves 20 such that the screws 60 tap into the sides of the grooves 20. To align all of the screw holes 45 with grooves 20, it may be necessary to position the component 40 at an angle with respect to the direction of the grooves 20.

Figure 7 shows a sectional view of Figure 6, in particular showing how a single screw 60 may engage with a groove 20. To mount a component 40 to the board 10, a screw 60 screwed into the groove 20 fastens the component 40 via a screw hole 45. In screwing, the screw 60 taps the taper of the groove 20, securing the screw 60 against removal. The taper of the groove 20 allows for a variety of screw sizes smaller than the width of the groove at its opening to be used, each engaging with the groove at a different depth.

It should be noted that the use of other fasteners, such as bolts or partially threaded screws or bolts, is possible with minimal or no modification to the grooves 20. Alternatively, it may be possible to use push-fit fasteners, rivets, and other alternatives with no or minor modifications to the groove arrangement.

The surface may be formed of a compliant material such as rubber, allowing

fasteners to be pushed into grooves without tapping. The material will then resist any force acting to pull the fasteners out of the grooves. This arrangement is well suited to assemblies used to test the fitting of components on a board or within a housing. In this case, it is desirable to use a reversed taper arrangement in the grooves such that the width of the groove is thinner at the entrance of the groove than deeper in the groove.

Various alternative configurations of the grooves 20 can be utilised in alternative aspects. In a second embodiment, the mounting board is formed of a series of concentric grooves separated by an equal distance. In a third embodiment, the mounting board is formed of a series of curved or curving grooves separated by an equal distance.

In a fourth embodiment, the mounting board is formed of a single groove comprised of a sequence of parallel grooves with U-shaped linking ends. This arrangement provides a series of parallel grooves as per the first embodiment but as one groove.

The mounting board may be made out of a variety of materials, including for example plastics or metals. Examples of suitable plastics include without limitation nylon, polycarbonate, polypropylene. Examples of suitable metals or metal alloys include without limitation aluminium alloys or brass or copper alloys. Such boards can be produced using extrusion, injection moulding, die-casting or other methods of casting.

The grooves can be designed to take into account such factors as: the size and/or type of screw; the required resistance to a pull-out force applied to a screw when engaged with a groove; and/or the hardness of material used to make a board. Further, the weight and weight distribution of the load or loads to be mounted onto the board using the grooves can be taken into consideration, along with the angle at which the load is being held, the depth of the screws, the screw type and the material of the screws.

The grooves can be provided in such a way as to overlap, for instance in a grid across the surface of a board, where two or more, parallel or otherwise, sets of grooves are provided on the surface of the board.

Further, the mounting board may be formed of composite materials, or using two or more materials for different sections of the board. The sections of different materials may or may not have grooves provided on the surface, such that only sections of the board made of one of the materials is provided with grooves. Alternatively, the entire board, regardless of material, can be grooved. The use of different materials can allow for further functionality in the board, for instance where one or more portions of the board is metallic, with portions that are non-conducting surrounding or separating the

metallic portions, a component can draw power from current provided through the one or more metallic portions.

The surface may be formed as part of another structure, rather than as a distinct component, for example as part of a light fitting or casing or door. Alternatively, it may be provided as a sheet of material that can be glued or otherwise affixed to another surface.

Other methods of manufacture may also be used. For example, the surface or board may be manufactured by way of '3D printing' whereby a three-dimensional model of the surface is supplied, in machine readable form, to a '3D printer' adapted to manufacture the surface. This may be by additive means such as extrusion deposition, Electron Beam Freeform Fabrication (EBF), granular materials binding, lamination, photopolymerization, or stereolithography or a combination thereof. The machine readable model comprises a spatial map of the object or pattern to be printed, typically in the form of a Cartesian coordinate system defining the object's or pattern's surfaces. This spatial map may comprise a computer file which may be provided in any one of a number of file conventions. One example of a file convention is a STL (STereoLithography) file which may be in the form of ASCII (American Standard Code for Information Interchange) or binary and specifies areas by way of triangulated surfaces with defined normals and vertices. An alternative file format is AMF (Additive Manufacturing File) which provides the facility to specify the material and texture of each surface as well as allowing for curved triangulated surfaces. The mapping of the surface may then be converted into instructions to be executed by 3D printer according to the printing method being used. This may comprise splitting the model into slices (for example, each slice corresponding to an x-y plane, with successive layers building the z dimension) and encoding each slice into a series of instructions. The instructions sent to the 3D printer may comprise Numerical Control (NC) or Computer NC (CNC) instructions, preferably in the form of G-code (also called RS-274), which comprises a series of instructions regarding how the 3D printer should act. The instructions vary depending on the type of 3D printer being used, but in the example of a moving printhead the instructions include: how the printhead should move, when / where to deposit material, the type of material to be deposited, and the flow rate of the deposited material.

The surface as described herein may be embodied in one such machine readable model, for example a machine readable map or instructions, for example to enable a physical representation of said surface to be produced by 3D printing. This may be in the form of a software code mapping of the surface and/or instructions to be

supplied to a 3D printer (for example numerical code).

The board can be made from a flexible material, allowing it to be attached to other surfaces where these other surfaces are both flat and non-flat, for instance glued to a flat wall or a curved structure.

In a further embodiment, the grooves arrangement as described according to any of the previous embodiments is used on a surface, for example a surface of a wall or table, which can then be used to mount components in the manner described above.

Any system feature as described herein may also be provided as a method feature, and vice versa. As used herein, means plus function features may be expressed alternatively in terms of their corresponding structure.

Any feature in one aspect may be applied to other aspects, in any appropriate combination. In particular, method aspects may be applied to system aspects, and vice versa. Furthermore, any, some and/or all features in one aspect can be applied to any, some and/or all features in any other aspect, in any appropriate combination.

It should also be appreciated that particular combinations of the various features described and defined in any aspects can be implemented and/or supplied and/or used independently.

CLAIMS:

1. A surface for mounting one or more lighting electronics components, the components suitable to be secured to the surface using fasteners, comprising:

    one or more grooves in the surface; and

    wherein the grooves are suitable for receiving the fasteners in order to attach one or more components to the surface.

2. The surface of claim 1 wherein the one or more grooves in the surface are a plurality of grooves in the surface.

3. The surface of any preceding claim, wherein the grooves are tapered.

4. The surface of claim 3, wherein the grooves are tapered along the depth of the groove.

5. The surface of claim 4, wherein the width of the groove at its opening is larger than the width of the groove at the deepest point of the groove.

6. The surface of any preceding claim, wherein the grooves are arranged to be substantially parallel.

7. The surface of any preceding claim, wherein the grooves are configured to engage a fastener.

8. The surface of any preceding claim, wherein the grooves are equally spaced apart along their length.

9. The surface of any preceding claim, wherein the surface takes the form of a board.

10. An apparatus substantially as hereinbefore described in relation to the Figures.

11. A method substantially as hereinbefore described in relation to the Figures.

12. A surface for mounting components, the components suitable to be secured to the surface using fasteners, comprising:

    one or more grooves in the surface; and

wherein the grooves are suitable for receiving the fasteners in order to attach one or more components to the surface.

13. A machine readable map, or machine readable instructions, configured to enable a 3D printer to manufacture the surface of any preceding claim.

Amendment to Claims have been filed as follows

CLAIMS:

1. A surface for mounting one or more lighting electronics components, the components suitable to be secured to the surface using fasteners, comprising:

one or more grooves in the surface; and

wherein the grooves are suitable for receiving the fasteners in order to attach one or more components to the surface; and

wherein the grooves are tapered.

2. The surface of claim 1 wherein the one or more grooves in the surface are a plurality of grooves in the surface.

3. The surface of claim 2, wherein the grooves are arranged to be substantially parallel.

4. The surface of claims 2 or 3, wherein the grooves are equally spaced apart along their length.

5. The surface of any preceding claim, wherein the grooves are tapered along the depth of the groove.

6. The surface of claim 5, wherein the width of the groove at its opening is larger than the width of the groove at the deepest point of the groove.

7. The surface of any preceding claim, wherein the grooves are configured to engage a fastener.

8. The surface of any preceding claim, wherein the surface takes the form of a board.

9. A mounting surface substantially as hereinbefore described in relation to the Figures.

10. A method of manufacturing a mounting surface substantially as hereinbefore described in relation to the Figures.

20 11 15

11. A surface for mounting components, the components suitable to be secured to the surface using fasteners, comprising:

one or more grooves in the surface; and

wherein the grooves are suitable for receiving the fasteners in order to attach one or more components to the surface; and

wherein the grooves are tapered.

12. A machine readable map, or machine readable instructions, configured to enable a 3D printer to manufacture the surface of any preceding claim.

Intellectual Property Office

Application No:	GB1419369.2	**Examiner:**	Mr Ben Johnson
Claims searched:	1 to 13	**Date of search:**	31 March 2015

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 to 9, 12 to 13	FR2741119 A (Pouyet) figures 1 and 2, abstract
X	1, 2, 6, 7, 8, 9, 12, 13	CN102990438 U (Jiangsu Wanfuan) figures 1 and 2, abstract, description of the specific embodiment
X	1 to 9, 12, 13	EP0617651 A (Fischer) figures 2, 2a, 3 and 9, abstract
X	1, 2, 6, 7, 9, 12, 13	US2008/232065 A (Rittal) figure 1, abstract, paragraphs 35 to 40
A	1	GB2453764 A (Colebrook Bosson Saunders) figure 7, abstract, page 6
A	1	DE19531592 A (Cordes) figure 1, abstract

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

H02B; H05K

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

Intellectual Property Office

International Classification:

Subclass	Subgroup	Valid From
H05K	0007/12	01/01/2006
H02B	0001/04	01/01/2006
H02B	0001/06	01/01/2006