

Cantilever Shelf, Display Fixture And Rack

Field of Invention

[001] The present invention relates to cantilever shelves, display fixtures and racks that are made from sheet metals or materials. These shelves, fixtures and racks are re-configurable and can be assembled and disassembled without using any tools.

Background

[002] Pegboards and perforated columns, with circular apertures or rectangular slots, usually form the vertical support structures of cantilever racks used in storage or display systems. To ensure platform stability, the support arrangement conventionally consists of at least two spaced-apart brackets engaging these apertures or slots, or a single bracket engaging two spaced-apart apertures/slots. These brackets are designed with edges to hitch or engage with edges of these spaced-apart apertures/slots. The applied loads on the brackets are then transferred to the vertical support structures.

[003] These conventional cantilever rack systems are often designed for a single purpose of storage; their multi-bracket designs are thus not optimised for easy and immediate reconfiguration according to changing decorative needs and layouts. For example, European patent publication no. 0499446, by Nuttall Shelving Systems, discloses a cantilever bracket system. As shown in FIGs. 1A and 1B, a horizontal projecting bracket **11** uses spaced-apart lugs **31, 32, 33** to fit into slots **27** on an upright support member **12** to support an applied load on the bracket.

[004] It can thus be seen that there exists a need for another type of cantilever storage or display racks that is simple in structure, easily reconfigured yet light and cost effective.

Summary

[005] The following presents a simplified summary to provide a basic understanding of the present invention. This summary is not an extensive overview of the invention, and is not intended to identify key features of the invention. Rather, it is to present some of the

inventive concepts of this invention in a generalised form as a prelude to the detailed description that is to follow.

[006] The present invention seeks to provide cantilever shelves, display fixtures or racks that can be assembled/disassembled or re-configured without using any tools, yet are strong, light and cost effective. Easy reconfiguration allows a user to change the layout of the shelves or fixtures according to utility, space or decorative needs. A selection of upright members with decorative appeal allows the shelves or fixtures to blend in with a design theme.

[007] In one embodiment, the present invention provides a cantilever shelf or rack comprising: an upright member formed from a sheet material, wherein the sheet material is formed with apertures or notches that are spaced apart at a predetermined pitch and layout and each aperture or notch has two downwardly inclined edges and a lateral entrance width p ; and a load support member also formed from a sheet material so that a tongue extends from an edge or corner to engage with the two downwardly inclined edges of an associated aperture or notch on the upright member, with a width of the tongue w being smaller than the entrance width p ; wherein the load support member is disposed in a substantially horizontal position when the tongue is fitted and engaged with the associated aperture or notch.

[008] In another embodiment, the present invention provides a method of erecting a cantilever shelf or rack, the method comprises: forming an upright member from a sheet material with apertures or notches, with the apertures or notches being spaced apart at a predetermined pitch in a horizontal direction and each aperture or notch has two downwardly inclined edges and an entrance width p ; and forming a load support member from a sheet material so that a tongue extends from an edge or corner to engage with the two downwardly inclined edges of an associated aperture or notch, with a width of the tongue w being smaller than the entrance width p ; wherein the load support member is in a substantially horizontal position when the tongue is fitted and engaged with the associated aperture or notch.

[009] Preferably, the two downwardly inclined edges of the aperture or notch are V-shaped, part circular, elliptical or parts of a composite shape. An upper edge adjoining the two

downwardly inclined edges of the aperture or each aperture is straight, curved or profiled to provide a decorative effect. In addition, the apertures are aligned or staggered to provide different types of layout of the shelves or racks.

[0010] Preferably, the load support member has a load bearing surface that is planar, formed with a depression or formed with an open or closed cutout. The depression or cutout may be used to locate a product, such as a flower pot, on the load support member.

Brief Description of the Drawings

[0011] This invention will be described by way of non-limiting embodiments of the present invention, with reference to the accompanying drawings, in which:

[0012] FIGs. 1A and 1B illustrate two components of a conventional cantilever shelf as disclosed in EP patent publication no. 0499446;

[0013] FIG. 2 illustrates a cantilever rack system of the present invention incorporating several configurations;

[0014] FIGs. 3A and 3B illustrate upright members which surfaces have various shapes of apertures or notches according to embodiments of the present invention;

[0015] FIGs. 4A-4E illustrate three embodiments of load support members for use with upright members according to other embodiments of the present invention;

[0016] FIGs. 5A-5B illustrate a load support member for use with a right-angled upright member, whilst FIGs. 5C-5D illustrate a load support member for use with an obtuse-angled upright member according to other embodiments of the present invention; and

[0017] FIGs. 6A-6B illustrate a load support member being formed with stiffening indentations along an edge formed by bending.

[0018] One or more specific and alternative embodiments of the present invention will now be described with reference to the attached drawings. It shall be apparent to one skilled in the art, however, that this invention may be practised without such specific details. Some of the details may not be described at length so as not to obscure the invention. For ease of reference, common reference numerals or series of numerals will be used throughout the figures when referring to the same or similar features common to the figures.

[0019] FIG. 2 shows a perspective view of a cantilever shelf or rack system **100** incorporating several embodiments of the present invention. Components of the cantilever shelf or rack system **100** are made from sheet metals or sheet materials; some suitable sheet materials are: engineering plastics, formed wood laminates, fibre reinforced resin boards and composite boards. These sheet materials are thin yet possess high strength to weight ratios. Each embodiment comprises a substantially upright member **110** with apertures **112, 112a-e** and/or notches **113, 113a-e** and a substantially horizontal load support member **140, 140a-140e** with a tongue or tongues **150, 150a, 150b** that is/are engageable with the cooperating aperture(s) **112, 112a-e/notch(es) 113, 113a-e** without using any tools. Once the tongues and associated apertures/notches are engaged, the load transfer members are sturdily connected to the upright member to transfer gravity loads applied on the horizontal load support member to the upright member **110**. Without external load, the tongues are easily disengaged from the associated apertures and the load support member becomes separated from the upright member, thus allowing speedy assembling, disassembling or reconfiguring. These sheet materials are light and can be handled manually. The upright member **110** may be mounted on a wall or any load bearing structure, mounted on a floor, suspended from a ceiling or elevated structure, or even as a free-standing column. Several upright members **110** may be even joined up to form a wall or dividing partition in a building or a hall. Each load support member **140** has a load bearing surface **142**; the load bearing surface **142** may be planar, formed with a depression or an open or closed cutout **142a**; for example, as shown in FIG. 2, one of the load support member **140e** is shown with a circular, closed cutout **142a** to locate a flower pot or a saucer tray. In the following description, lower, upper, downward or horizontal position is defined with respect to orientation of the upright member **110**.

[0020] FIG. 3A shows the upright member **110** is formed with various shapes of the apertures **112**, **112a-e**. FIG. 3A shows only one exemplary layout pattern of the apertures. The layout pattern allows different ways of configuring the cantilever shelf and rack of the present invention. For illustration purposes, FIG. 3A shows the upright member **110** has a flat panel portion **110a**, a right-angled corner **110b**, an obtuse-angled corner **110c** and two mounting flanges **111** for fixing onto an external structure. In FIG. 3A, the apertures **112** are shown to have lower edges that are V-shaped **112a** with the apex pointing downwards, elliptical **112d** or part circular **112e**. The apertures **112**, **112a-112e** can be on the flat panel portion **110a**, at the right-angled corner **110b** or at the obtuse-angled corner **110c**. Preferably, the apertures **112b-112c** are formed symmetrically about the right-angled **110b** or obtuse-angled corner **110c**. Other shapes are also possible as long as the apertures **112** have two downwardly tapered edges and have a lateral dimension **p** that allows the tongue **150**, **150a-150b** to be inserted into an associated aperture with clearance fit. In addition, the upper edge **114** of these apertures **112** may be profiled to give them a decorative effect; with these profiled upper edges **114**, the apertures become fan-shaped **114a**, heart-shaped **114b**, butterfly-shaped, and so on.

[0021] FIG. 3B shows the upright support member **110** is formed with open apertures or notches **113**. Like the above apertures **112**, the notches may be V-shaped **113a**, elliptical **113d** or part circular **113e**. The notches **113a-113e** can be on the flat panel portion **110a**, at the right-angled corner **110b** or at the obtuse-angled corner **110c**. Preferably, the notches **113b-113c** are formed symmetrically about the right-angled **110b** or obtuse-angled corner **110c**.

[0022] FIGs. 4A and 4B show a load support member **140a** according to another embodiment. The load support member **140a** is made from a substantially rectangular sheet metal or sheet material **142** with two opposite edges being formed downward as side flanges **143** and the tongue **150** extends out of a rear edge **146** connecting the two opposite edges. Preferably, the tongue **150** is located mid-way along the rear edge **146** and is joined thereto by a neck **152**. As seen in FIGs. 4A and 4B, the neck **152** is formed by two in-line slots **154**, one on each side of the tongue **150** to give the neck a width **n**. The width of the tongue is denoted dimension **w** and the width of the slot **154** is denoted dimension **s**. The rear edge **146** is straight and substantially perpendicular to the flanges **143**, and the load support member **140a** is thus suitable for use with the above apertures **112**, **112a**, **112d-e**

or notches **113**, **113a**, **113d-e**. When the tongue **150** is fitted and engaged in the aperture **112**, **112a**, etc, each rear end **144** of each of the flanges **143** contacts an outside face **110o** of the upright member **110a** whilst each of the inside edges **156** of each slot **154** contacts an inside face **110i** of the upright member at the aperture **112**; these contact areas are spaced apart by substantially a depth of the flanges **143** at the ends **144** and are thus able to provide a resisting moment to keep the load support member **140a** in position. A horizontal offset distance between the inside edges **156** at the slots and the rear end faces **144** of the flanges **143**, as seen in FIG. 4B, equals a thickness **t** of the upright member **110a** so that the load support member **140a** remains substantially horizontal, even under an external, applied load.

[0023] In the above embodiment, the flanges **143** are uniformly rectangular; in another embodiment, it is possible that the flanges **143a** are tapered, with the depth at the rear end **144** being wider, as shown in FIG. 4A.

[0024] FIGS. 4C and 4D show a load support member **140b** according to another embodiment. The load support member **140b** is similar to the above embodiment **140a**, except that corresponding contact areas with the outside face **110o** of the upright member **110a** are provided by two rear, downward flanges **148**, with each rear flange **148** being formed on each side of the tongue **150**. As shown in FIG. 4D, the horizontal offset distance between the contact faces of the rear flanges **148** and the inside edges **156** of the slots **154** is equal to the thickness **t** of the upright member **110a**, so that the load support member **140b** is substantially horizontal. Compared with the above embodiment, the slots **154** of the load support member **140b** is wider than that of the above load member **140a** due to the radius of bending of the rear flanges **148**. It is possible that the slots **154** in these two embodiments are of the same width by providing a relief notch (not shown in the figure) at the rear edge **146** adjoining each rear flange **148**.

[0025] In the above embodiment, the free edges of the load support member **140b** and the flanges **148** are straight; in another embodiment, the free edges of the load support member (such as the side and/or front edges) and of the flanges are profiled **142b**, **148a**, as shown in FIG. 4C.

[0026] FIG. 4E shows a load support member **140c** according to another embodiment. The load support member **140c** is similar to the above embodiment **140b** except that the load support member **140c** has a plurality of tongues **150**. The tongues **150** are spaced apart to correspond with the pitch distance of the cooperating apertures **112**, **112a**, **112d-e** on the upright member **110a**. It is also possible that a load support member similar to the above embodiment **140a** is provided with a plurality of tongues. The length of these load support members having a plurality of tongues **150** can be cut according to the aperture pitch distance in the horizontal direction, desired length or allowable loading intensity.

[0027] FIGs. 5A and 5B show a load support member **140d** according to another embodiment. As shown in FIG. 5A, the load support member **140d** is made from a quadrilateral or sectorial piece of sheet metal or sheet material with a square corner **141**. Two slots **154a** inclined to each other are formed at the square corner **141** of the sheet metal/material to form a tongue **150a** with a neck **152** and the two edges adjacent the slots **154a** are then formed downward to form flanges **143b**. The widths of the tongue **150a** and neck **152** are also denoted dimensions **w** and **n**, respectively, in FIG. 5B. The tongue **150a** is dimensioned to fit with the above apertures **112b** and notch **113b**; when fitted, the rear ends **144a** of the flanges **143b** contact an outside face **110o** of the upright member **110b** whilst each of the inside edges **156** of the tongue **150a** contacts an inside face **110i** of the upright member at the aperture **112b**; these contact areas are spaced apart by substantially a depth of the flanges **143b** at the rear end and are thus able to provide a resisting moment to keep the load support member **140d** in position. A horizontal offset distance between the inside edges **156** of the tongue **150a** and the rear end faces **144a** of the flanges **143b**, as shown in FIG. 5B, equals the thickness **t** of the upright member **110b** so that the load support member **140d** is substantially horizontal.

[0028] FIGs. 5C and 5D show a load support member **140e** according to another embodiment. The load support member **140e** is similar to the above load member **140d** except that a corner **141a** at which a tongue **150b** is formed subtends an angle of less than 90 degree. The manner of the tongue **150b** engaging with the aperture **112c** of upright member **110c** is as described above and no further description is deemed necessary.

[0029] In another embodiment, it is possible to vary the angle between the two inclined slots **154a** so that the tongue **150a**, **150b** is engageable in an aperture **112** formed on a curved section of the upright member **110**.

[0030] Corners of the flanges **148** formed on the load support members **140b**, **140c** can be strengthened against bending by forming indentations **149**. For example, FIGs. 6A and 6B show indentations **149** are formed by a tool **90** at the radiused corner between the flanges **148** and the load bearing surface **142**. The indentations **149** give the adjoining flanges dimensional stability and rigidity. Depending on the thickness of the load member and required rigidity, two or more indentations **149** can be formed along the bent edge.

[0031] While specific embodiments have been described and illustrated, it is understood that many changes, modifications, variations and combinations thereof could be made to the present invention without departing from the scope of the invention. For example, the apertures **112** can even be round or of a composite shape having two downwardly inclined edges. The sheet-like material of the upright member can be formed readily by extrusion, other than through bending operation. When the upright member is not substantially vertical, it is still possible to provide a load support member **140** in a substantially horizontal position by varying the geometry of the rear ends **144**, **144a** of the flanges **143**, **143a**, **143b** or varying the angle of bending of the flanges **148** of the load support member **140b**, **140c**.

CLAIMS:

1. A cantilever shelf or rack comprising:
an upright member formed from a sheet material, wherein the sheet material is formed with apertures or notches that are spaced apart at a predetermined pitch and layout and each aperture or notch has two downwardly inclined edges and a lateral entrance width p ; and
a load support member also formed from a sheet material so that a tongue extends from an edge or corner to engage with the two downwardly inclined edges of an associated aperture or notch on the upright member, with a width of the tongue w being smaller than the entrance width p ;
wherein the load support member is disposed in a substantially horizontal position when the tongue is fitted and engaged with the associated aperture or notch.
2. A cantilever shelf or rack according to claim 1, wherein the two downwardly inclined edges of the aperture or notch are V-shaped, part circular, elliptical or parts of a composite shape.
3. A cantilever shelf or rack according to claim 2, wherein an upper edge adjoining the two downwardly inclined edges of the aperture or each aperture is straight, curved or profiled.
4. A cantilever shelf or rack according to any one of the preceding claims, wherein the aperture or notch is located on a flat, right-angled, obtuse-angled or curved portion of the upright member.
5. A cantilever shelf or rack according to any one of the preceding claims, wherein the upright member is operable for free standing on a ground, hanging from an elevated structure or mounting on an external structure.
6. A cantilever shelf or rack according to claim 5, wherein the upright member further comprises a mounting flange.
7. A cantilever shelf or rack according to any one of the preceding claims, wherein the load support member is quadrilateral or sectorial in shape or profiled with a straight edge.

8. A cantilever shelf or rack according to claim 7, wherein when the load support member is quadrilateral or profiled with a straight edge, the tongue is formed to extend from a or the straight edge.
9. A cantilever shelf or rack according to claim 8, wherein the straight edge on each of two sides of the tongue is formed as a downward flange.
10. A cantilever shelf or rack according to claim 8, wherein two edges adjacent the straight edge are formed as downward side flanges.
11. A cantilever shelf or rack according to claim 8, wherein the tongue comprises two or more tongues which are spaced apart according to a horizontal pitch distance of the engaging apertures or notches.
12. A cantilever shelf or rack according to claim 7, wherein when the load support member is quadrilateral or sectorial, the tongue is formed at a corner and each of two adjoining edges is formed as a downward flange.
13. A cantilever shelf or rack according to claim any one of claims 7-12, wherein each of the tongue is formed by two opposite slots of a predetermined width s to produce a neck with a width n .
14. A cantilever shelf or rack according to claim 13, wherein the two opposite slots are in-line or inclined to each other.
15. A cantilever shelf or rack according to claim 13 or 14, wherein an inside edge of each slot is in contact with an inner face of the upright support member at the associated aperture or notch, whilst end edges or faces of the flanges contact an outside face of the upright member at the associated aperture or notch, wherein the inside edges of the slots and the end edges/ faces of the flanges are spaced apart to provide a resisting moment to support an applied load on the load support member.

16. A cantilever shelf or rack according to claim 15, wherein a horizontal distance between the inside edge of the slot and the end edges/faces of the flanges is substantially equal to a thickness t of the upright member.
17. A cantilever shelf or rack according to any one of the preceding claims, wherein a load bearing surface of the load support member is planar, formed with a depression or formed with an open or closed cutout.
18. A cantilever shelf or rack according to any one of the preceding claims, wherein the sheet material is selected from: metal, engineering plastic, formed wood laminate, fibre reinforced resin or composite.
19. A method of erecting a cantilever shelf or rack, the method comprises:
forming an upright member from a sheet material with apertures or notches, with the apertures or notches being spaced apart at a predetermined pitch in a horizontal direction and each aperture or notch has two downwardly inclined edges and an entrance width p ; and
forming a load support member from a sheet material so that a tongue extends from an edge or corner to engage with the two downwardly inclined edges of an associated aperture or notch, with a width of the tongue w being smaller than the entrance width p ;
wherein the load support member is in a substantially horizontal position when the tongue is fitted and engaged with the associated aperture or notch.
20. A method according to claim 19, further comprises arranging the apertures or notches in rows and aligning the apertures or notches in a vertical direction.
21. A method according to claim 19, further comprises arranging the apertures or notches in rows and staggering the apertures or notches in a vertical manner.
22. A method according to any one of claims 19-21, further forming an upper edge adjoining the two downwardly inclined edges of the aperture or each aperture with a straight, curved or profiled edge.

23. A method according to any one of claims 19-22, further forming a planar, depressed, an open cutout or a closed cutout load bearing surface on the load support member.