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### **TILTING AND SLIDING SYSTEM FOR A SHELF HAVING SIDE SUPPORT ARMS RECEIVABLE INTO APERTURES IN VERTICAL POSTS**

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#### **Abstract**

A shelving system with a shelf, two rear vertical posts and two front vertical posts. The posts all have vertically spaced apart openings passing therethrough. The shelf has a pair of front side support arms that pass through the apertures in the front vertical posts and a pair of rear side support arms that pass through the apertures in the rear vertical posts. The rear of the shelf can be raised or lowered and re-attached in a new position while the front side support arms remain positioned within the apertures in the front vertical posts. If the rear of the shelf is accidentally dropped, the shelf rotates such that the front side support arms lock against the top and bottom of the vertically spaced apart apertures, thereby preventing the shelf from falling.

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## **Background/Summary**

RELATED APPLICATIONS [0001] The present application is related to Provisional Patent Application Ser. No. 63/551,374, of same title, filed Feb. 8, 2024, and to Provisional Patent Application Ser. No. 63/574,655, also of same title, filed Apr. 4, 2024, and to Provisional Patent Application Ser. No. 63/674,719, also of same title, filed Jul. 23, 2024; the entire disclosures of which are incorporated herein by reference in their entireties.

### **TECHNICAL FIELD**

[0002] The present invention relates to shelving systems such as shelves used in [0003] product display cabinets, behind glass refrigerator doors or any other system where products are placed on shelves in supermarkets, convenience stores or other locations.

### **BACKGROUND OF THE INVENTION**

[0004] Many different systems currently exist for positioning shelves. Unfortunately, to change the position of any of these shelves requires relocating insert, brackets, attachments or other system components.

[0005] It would instead be desirable to provide a system that allows the shelf to be quickly and easily moved both back and forth (i.e.: in a horizontal direction), up and down and tilted to various non-horizontal angles. Moving the shelf back and forth in a horizontal direction would provide better visibility and would make it easier to remove the product from the shelf. Tilting the shelf would be especially useful to ensure that the products loaded onto the shelf slide forwards towards the front of the shelf for easy customer access. In addition, a shelf that can be tilted (i.e.: with its rear end lifted) and then quickly put back into a horizontal position can be loaded faster than a shelf that remains horizontal at all times. This is because as products are loaded onto the shelf (for example, milk cartons) they will easily slide towards the front of the shelf. Tilting the products forwards against another product will also prevent them from toppling over. Instead, the products will tend to slide towards one another, thereby filling the shelf as it is being loaded. Once the shelf has been fully loaded, it can be pushed back into the frame supporting it and put in a horizontal position again (if so desired). As will be shown, the Applicant's system permits quick, easy and safe movement of the shelf in a horizontal direction. It also permits quick, easy and safe rotation of the angle of the shelf.

[0006] In addition, it would also be desirable to provide a shelving system in which the shelf will bind (rather than simply fall) if the rear end of the shelf is accidentally dropped when it is being moved. This is especially problematic if there are products or goods sitting on the shelf making it heavier when an operator releases the rear end of the shelf to move the rear end of the shelf upwards or downwards to adjust the angle of the shelf. As will be shown, the Applicant's system solves this problem without requiring springs, brackets or other attachment mechanisms.

### **SUMMARY OF THE INVENTION**

[0007] In preferred aspects, the present system provides a shelving system, comprising: [0008] (a) an assembly with: [0009] two front vertical posts having a series of vertically spaced apart apertures passing therethrough, and [0010] two rear vertical posts having a series of vertically spaced apart apertures passing therethrough; and [0011] (b) a shelf comprising: [0012] a main body, [0013] a pair of front side support arms extending from opposite sides of a front portion of

the main body, wherein the front side support arms enter or extend through the vertically spaced apart apertures in the front vertical posts, and [0014] a pair of rear side support arms extending from opposite sides of a rear portion of the main body, wherein the rear side support arms enter or extend through the vertically spaced apart apertures in the rear vertical posts.

[0015] An important advantage of the present shelving system is that the rear of the shelf can be raised or lowered and re-attached into a new position while the front side support arms remain continuously positioned within the apertures in the front vertical posts. Therefore, if the rear of the shelf is accidentally dropped, the shelf rotates such that the front side support arms lock against the top and bottom of the vertically spaced apart apertures, holding the shelf and preventing the shelf from falling.

[0016] In preferred embodiments, the rear side support arms have a series of bottom notches or protrusions thereon, and these notches or protrusions lock onto the vertically spaced apart apertures in the rear vertical posts. These notches or protrusions may be made in many shapes, including but not limited to cactus-shaped or saw-tooth shaped and may be positioned at many positions with respect to one another. If cactus-shaped or saw-tooth shaped, the notch may optionally have a straight portion that locks against the edges of the vertically spaced apart apertures in the rear vertical posts.

[0017] In preferred embodiments, each of the vertically spaced apart apertures in the rear vertical posts may include a front wall aperture and a back wall aperture, with the front wall aperture being positioned lower than the back wall aperture. The advantage of this geometry is that the front side support arms rotate to lock against the top and bottom of the vertically spaced apart apertures if the rear of the shelf is accidentally dropped (for example, if the rear side support arms are removed from the vertically spaced apart apertures in the vertical rear posts and the rear portion of the shelf is accidentally released).

[0018] In accordance with the present system, the rear of the shelf can be lifted to tilt the shelf forwardly while the front side support arms have entered or extend fully through the vertically spaced apart apertures in the front vertical posts. Similarly, the rear of the shelf can be released and dropped to tilt the shelf backwardly while the front side support arms extend fully through the vertically spaced apart apertures in the front vertical posts. As will be shown, this can be accomplished by having the front side support arms being longer than the rear side support arms.

[0019] In preferred aspects, the front and rear vertical posts can be rectangular in cross section. In such embodiments, each of the vertically spaced apart apertures in the front vertical posts preferably include a front wall aperture and a back wall aperture, with the front wall aperture being positioned lower than the back wall aperture. Alternatively, however, the front and rear vertical posts can be many other shapes, including but not limited to being T-shaped, U-shaped, C-shaped or I-shaped in cross section having only one aperture passing therethrough. Optionally, a plurality of shelves may be supported on the left and right sides of the vertical posts (for example in a long horizontal display cabinet). The apertures may be made in the same or different shapes and sizes in the front and rear vertical posts. The size and shape of these apertures will correspond to the size and shape of the side support arms passing therethrough.

[0020] As such, the present system provides a novel mechanism for positioning the shelf such that the angle of the shelf and the vertical and horizontal position of the shelf with respect to the vertical posts can both be easily adjusted by easily moving the shelf to various positions.

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## Description

### BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. 1A is a perspective view of the present system with the shelves positioned horizontally.

[0022] FIG. 1B is a perspective view of the present system with the rear end of one of the shelves

in a raised position, tilting the shelf forwards.

[0023] FIG. 1C is a perspective view of the present system with a rear end of one of the shelves in a lowered position, tilting the shelf backwards.

[0024] FIG. 1D is a simplified rear perspective view of the present system with the wireframe portion of the shelf removed for clarity of illustration showing the side support arms passing through apertures in front and rear vertical support posts.

[0025] FIG. 2A is a front elevation view of one of the front vertical posts showing the position of the vertically spaced apart apertures passing through the front side of the post.

[0026] FIG. 2B is a rear elevation view of one of the front vertical posts showing the position of the vertically spaced apart apertures passing through the back side of the post.

[0027] FIG. 2C is a side elevation view of one of the front vertical posts.

[0028] FIG. 3A is a top plan view of the shelf and the front and back vertical posts when the shelf is locked in a horizontal position.

[0029] FIG. 3B is a top plan view similar to FIG. 3A, but after the shelf has been moved horizontally forwards.

[0030] FIG. 3C is a top plan view similar to FIG. 3A, but after the rear end of the shelf has been moved to a raised position, thereby tilting the shelf forwards.

[0031] FIG. 3D is a top plan view similar to FIG. 3A, but after the rear end of the shelf has been pulled back to disconnect it from the back vertical post and dropped.

[0032] FIG. 4 is a side elevation view illustrating each of the various positions of FIGS. 3A to 3D. Detail views of each of these positions are also illustrated.

[0033] FIG. 5A is a sectional side elevation view of a notched rear side support arm in an inclined position latching onto one of the apertures in the front of the rear vertical post.

[0034] FIG. 5B sectional side elevation view of a notched rear side support arm in a horizontal position latching onto one of the apertures in the rear of the rear vertical post.

[0035] FIG. 6A is a front elevation view of a T-shaped vertical front post having a series of apertures passing therethrough.

[0036] FIG. 6B is a top plan view corresponding to FIG. 6A.

[0037] FIG. 7A is a front elevation view of a U-shaped vertical front post having a series of apertures passing therethrough.

[0038] FIG. 7B is a top plan view corresponding to FIG. 7A.

[0039] FIG. 8 is a rear elevation view showing additional shelves to the left and right of the system showing how the vertical posts can support shelves on either side.

#### DETAILED DESCRIPTION OF THE DRAWINGS

[0040] The present invention provides various systems for positioning a shelf (which may optionally be a wireframe shelf but is not limited to wireframe shelves) such that both the angle of the shelf and the vertical and horizontal position of the shelf can both be adjusted quickly and easily without the need for moveable inserts, brackets, S-hooks, etc.

[0041] FIGS. 1A, 1B and 1C illustrate various positions of the present shelving system. For clarity of illustration, the shelves are simplified and side stops (which prevent products from falling off the sides of the shelves) are removed. The present shelving system includes two shelves **10**, each having a front end that is supported by front vertical posts **22** and a rear end that is supported by rear vertical posts **24**. Shelf **10** may be a wireframe shelf or other form of shelf including shelves with continuous solid bottoms, etc. As seen in FIG. 1A, the top shelf **10** may be pulled back, lifted and pushed into a horizontal position. As seen in FIG. 1B, the rear end of top shelf **10** may be lifted and pushed into position. This tilts the shelf forwards. Alternatively, as seen in FIG. 1C, the rear end of top shelf **10** may be pulled back and released. This tilts the shelf backwards, yet the shelf does not fall.

[0042] FIG. 1D is a simplified rear perspective view of the present system with the wireframe portion of the shelf removed for clarity of illustration showing the side support arms **50** and **52**

passing through apertures **60** in front and rear vertical support posts **22** and **24** respectively. Vertical posts **22** and **24** may be made with the same geometries or with different geometries. In addition, the shape of apertures **60** in these posts may be the same or different. Preferably, the shape of aperture **60** in each of vertical posts **22** and **24** will correspond to the shape of the side support arms **50** or **52** passing therethrough.

[0043] In preferred embodiments, the present system provides a shelving system, comprising:

[0044] (a) an assembly comprising: [0045] two front vertical posts **22** having a series of vertically spaced apart apertures **60** passing therethrough, and [0046] two rear vertical posts **24** having a series of vertically spaced apart apertures passing **60** therethrough; and [0047] (b) a shelf **10** comprising: [0048] a main body **11**, [0049] a pair of front side support arms **50** extending out from opposite sides of a front portion of main body **11**, wherein front side support arms **50** extend fully through the vertically spaced apart apertures **60** in the front vertical posts **22**, and [0050] a pair of rear side support arms **52** extending from opposite sides of a rear portion of main body **11**, wherein the rear side support arms **52** extend fully through the vertically spaced apart apertures **60** in the rear vertical posts **24**.

[0051] The unique advantages of the present system are achieved by, among other things, having side support arms **50** and **52** extending outwardly from the sides of a shelf **10** and passing through apertures **60** in front and rear vertical posts **22** and **24**. As will be shown, this provides a system where both the vertical and horizontal position of shelf **10** and the angle of shelf **10** can be adjusted and changed quickly and easily without the need for moveable inserts, brackets, S-hooks, etc. The preferred geometry and position of apertures **60** in front vertical post **22** is shown in FIGS. 2A to 2C. As can be seen, front vertical post **22** can be a hollow square tube. Apertures **60** include apertures **61** cut through the front face of the beam and apertures **62** cut through the back face of the beam. Front support arm **50** will pass through both of these apertures (**61** and **62**) as it passes fully through front post **22**. In accordance with preferred embodiments, and as can be seen, corresponding apertures **61** and **62** are slightly offset from one another with front apertures **61** being slightly lower and back apertures **62** being slightly higher (as seen in the dotted line between FIGS. 2A and 2B). The importance of this detail will be seen more in FIG. 4. In alternate embodiments, side support arm **50** need not pass fully through vertical front post **22**, but instead remain balanced on the back apertures **62**.

[0052] FIGS. 3A to 3D illustrate the interaction of side support arms **50** and **52** and vertical posts **22** and **24**. FIG. 4 corresponds to each of these illustrated positions. Specifically, FIG. 3A corresponds to the position of shelf **10A** in FIG. 4. FIG. 3B corresponds to the position of shelf **10B** in FIG. 4. FIG. 3C corresponds to the position of shelf **10C** in FIG. 4. Lastly, FIG. 3D corresponds to the position of shelf **10D** in FIG. 4.

[0053] As such, FIG. 3A shows a first position of shelf **10** (**10A** in FIG. 4) in which front side support arms **50** pass through the apertures passing through front vertical post **22** and rear side support arms **52** pass through the apertures passing through rear vertical post **24**. Next, as seen in FIG. 3B, shelf **10** (**10B** in FIG. 4) is pushed forwards. As such, front side support arm **50** projects farther out through front vertical post **22** while rear side support arm **52** will also move to project further through rear vertical post **24**.

[0054] Next, the operator may desire to change the angle of the shelf. This is done by simply pulling shelf **10** backwards such that rear side support arms **52** are pulled out of apertures **60** in rear vertical post **24**. This will fully disconnect rear side support arms **52** from rear vertical post **24**. Since front side support arms **50** are longer than rear side support arms **52**, the front side support arms **50** will not disconnect from front vertical post **22**. Once the rear of the shelf has been disconnected, the operator can then decide to raise or lower this rear end of the shelf (thus tilting the shelf forwards or backwards, as desired). In FIG. 3C, the operator has selected to raise the rear end of shelf **10** (**10C** in FIG. 4). After the rear end of the shelf has been raised to a desired position, the operator then simply pushes the shelf forwards such that rear side support arms **52** reengage and

pass through apertures that are located up higher on rear vertical post **24**.

[0055] FIG. **3D** illustrates an important novel safety feature of the present system. Specifically, in FIG. **3D**, the operator has disengaged the rear side support arms **52** from rear vertical post **24**, but then has inadvertently dropped the rear end of the shelf. In this situation, the rear end of shelf **10** (**10D** in FIG. **4**) will fall some short distance. However, at this time, the front side support arms **50** will bind and lock into the apertures **60** in front vertical post **22**. Specifically, as seen in the Detail view of FIG. **4**, the top of front side support arms **50** will push up against the top of aperture **61** while the bottom of front side support arms **50** will push down against the bottom of aperture **62**. This same orientation is shown by the top shelf **10** in FIG. **1C**.

[0056] FIG. **4** illustrates the four vertically spaced apart shelves **10** of FIGS. **3A** to **3D** stacked above one another in a shelving system. Shelves **10A** and **10B** are horizontal. The Detail views corresponding to shelves **10A** and **10B** show the front side support arms **50** passing between the front and rear apertures **61** and **62**. As can be seen, the bottom edge of front side support arms **50** rests on top of rear aperture **62**.

[0057] Next, shelf **10C** has had its rear end raised and the shelf is tilted forwards. The corresponding Detail view shows the maximum angle for this system's geometry where the top of front side support arms **50** hit and push against the top of rear aperture **62** while the bottom of front side support arms **50** sits on the bottom edge of front aperture **61**.

[0058] Lastly, shelf **10D** has had its rear end unlocked (released from rear vertical posts **24**) and then accidentally dropped. In accordance with the present safety system, shelf **10D** does not simply detach and fall to the ground or on top of a lower shelf. Instead, shelf **10D** will tilt backwardly until it reaches a position where its front side support arm **50** binds and locks into the apertures with the bottom of the front side support arm **50** resting on the bottom of rear aperture **62** and the top of front side support arm **50** butting against the top of front aperture **61**. (See also the top shelf in FIG. **1C**).

[0059] In accordance with various preferred aspects of the present system, the rear side support arms have a series of bottom notches **55** thereon. These notches may be of different shapes. For example, notches **55** may be cactus-shaped, saw-tooth shaped, hook-shaped, sinusoidal in shape, projections or extensions coming from the bottom of the side support arms, etc. In one embodiment, notches **55** may be cactus-shaped or saw-tooth shaped as illustrated having a straight portion **57** and an angled portion **59**. As can be seen in FIG. **5A**, the straight portions **57** of the notches can lock against the edges of the vertically spaced apart front apertures **61** in the vertical rear posts **24**. Alternatively, or in addition, the straight portions **57** of the notches may also lock against the edges of the vertically spaced apart rear apertures **62**. As seen in FIG. **5B**, the notches **55** can also lock against the edges of the front and back apertures **61** and **62** while the shelf is in a horizontal position.

[0060] In the various preferred embodiments described above, the front and rear vertical posts **22** and **24** are rectangular in cross section. It is to be understood, however, that the present system is not limited to only hollow square or rectangular designs. For example, FIGS. **6A** and **6B** illustrate a T-shaped cross section front vertical post **22A** having apertures **61A** passing through only one plane of material. Similarly, FIGS. **7A** and **7B** illustrate a C-shaped cross section front vertical post having apertures **61B** again passing through only one plane of material. In both of the embodiments of FIGS. **6A** to **7B**, front side support arms **50** can bind against the top and bottom of the apertures **61B** if the rear of the shelf is detached from rear vertical post **24** and inadvertently dropped. It is to be understood that in these embodiments, the sizes of apertures **61A** and **61B** are expected to more closely match the height of the front side support arms **50** to obtain a more optimal fit. This may also necessitate shelf **10** having more limited mobility in terms of tilting rotation forwards or backwards as compared to the previously described embodiments that use a hollow square front vertical post **22** (which would have points of contact at both front apertures **61** and at back apertures **62**).

[0061] In an alternate embodiment, rear side support arms 52 are longer than rear side support arms 50. As such, an operator standing at the front of the system can adjust the position of the shelf by pushing it back to detach side support arms 50 from front vertical post 22. Next, the front of the shelf can be raised or lowered as desired, and then reattached to front vertical post 22. In the event that the front of the shelf is accidentally dropped, the rear side support arms 52 will bind within apertures 60 in rear vertical post 24, preventing the shelf from falling.

[0062] Lastly, FIG. 8 illustrates a rear view of the system illustrated in FIG. 4 (but with shelves 10C and 10D having been returned to their horizontal position. As can be seen, the rear of posts 24 have pairs of apertures 62 on their back sides. As seen in previous Figures, front posts 22 also have pairs of vertically spaced apart apertures 60 on their front and back as well. As seen in FIG. 8, this permits additional shelves 10 to be hung from the left and right sides of these vertical posts. As such, the present system can be used in large display cabinets with multiple shelves extending to the left and right while these shelves are supported by shared front and back vertical posts.

[0063] In the illustrated embodiments, vertical posts 22 and 24 can together form a frame around the shelf. These bars may optionally be connected together by additional top, bottom or side members to form a frame or a box-like enclosure. It is to be understood that many different geometries are possible, and that vertical posts 22 and 24 may be attached together in different ways using different geometries, all keeping within the scope of the present system. For example, vertical posts 22 and 24 can be connected to systems that use or include refrigerator doors. The present system can optionally be constructed by attaching the front posts 22 to the doorframe and the rear posts 24 can be freestanding and held in place by the shelves. Other alternatives and designs are also contemplated, all keeping within the scope of the present invention.

[0064] In all of its various embodiments, the present system provides an elegant and non-obvious mechanism for positioning shelf 10 with respect to the vertical posts 22 and 24 (or frame encompassing these vertical posts) such that the angle and horizontal position of shelf 10 can be adjusted by moving the shelf quickly, easily and safely without the need for moveable inserts, brackets, S-hooks, etc.

## Claims

1. A shelving system, comprising: (a) an assembly comprising: two front vertical posts having a series of vertically spaced apart apertures passing therethrough, and two rear vertical posts having a series of vertically spaced apart apertures passing therethrough; and (b) a shelf comprising: a main body, a pair of forwardly pointing front side support arms extending from opposite sides of a front portion of the main body, wherein the front side support arms extend fully through corresponding vertically spaced apart apertures from the series of vertically spaced apart apertures in the front vertical posts, and a pair of forwardly pointing rear side support arms extending from opposite sides of a rear portion of the main body, wherein the rear side support arms extend fully through corresponding vertically spaced apart apertures from the series of vertically spaced apart apertures in the rear vertical posts.
2. The shelving system of claim 1, wherein each rear side support arm has a series of bottom notches or protrusions thereon.
3. A shelving system, comprising: (a) an assembly comprising: two front vertical posts having a series of vertically spaced apart apertures passing therethrough, and two rear vertical posts having a series of vertically spaced apart apertures passing therethrough; and (b) a shelf comprising: a main body, a pair of front side support arms extending from opposite sides of a front portion of the main body, wherein the front side support arms extend fully through corresponding vertically spaced apart apertures from the series of vertically spaced apart apertures in the front vertical posts, and a pair of rear side support arms extending from opposite sides of a rear portion of the main body, wherein the rear side support arms extend fully through corresponding vertically spaced apart

apertures from the series of vertically spaced apart apertures in the rear vertical posts, wherein the rear side support arms have a series of bottom notches or protrusions thereon, and wherein the notches are cactus-shaped or saw-tooth shaped.

**4.** The shelving system of claim 3, wherein the cactus-shaped or saw-tooth shaped notches have a straight portion and an angled portion, and wherein the straight portions of the notches are configured to lock against edges of the corresponding vertically spaced apart apertures in the rear vertical posts.

**5.** The shelving system of claim 2, wherein corresponding bottom notches from the series of bottom notches are configured to lock onto the corresponding vertically spaced apart apertures in the rear vertical posts.

**6.** A shelving system, comprising: (a) an assembly comprising: two front vertical posts having a series of vertically spaced apart apertures passing therethrough, and two rear vertical posts having a series of vertically spaced apart apertures passing therethrough; and (b) a shelf comprising: a main body, a pair of front side support arms extending from opposite sides of a front portion of the main body, wherein the front side support arms extend fully through corresponding vertically spaced apart apertures from the series of vertically spaced apart apertures in the front vertical posts, and a pair of rear side support arms extending from opposite sides of a rear portion of the main body, wherein the rear side support arms extend fully through corresponding vertically spaced apart apertures from the series of vertically spaced apart apertures in the rear vertical posts, wherein the rear side support arms have a series of bottom notches or protrusions thereon, wherein the bottom notches lock onto the vertically spaced apart apertures in the rear vertical posts, and wherein each of the vertically spaced apart apertures in the rear vertical posts include a front wall aperture and a back wall aperture, and wherein the front wall aperture is positioned lower than the back wall aperture.

**7.** The shelving system of claim 6, wherein the rear of the shelf can be lifted to tilt the shelf forwardly while the front side support arms extend fully through the corresponding vertically spaced apart apertures in the front vertical posts.

**8.** The shelving system of claim 6, wherein the rear of the shelf can be released and dropped to tilt the shelf backwardly while the front side support arms extend fully through the corresponding vertically spaced apart apertures in the front vertical posts.

**9.** The shelving system of claim 1, wherein the rear side support arms can be withdrawn from the corresponding vertically spaced apart apertures in the rear vertical posts and the rear portion of the shelf can be released and dropped to tilt the shelf backwardly while the front side support arms extend fully through the corresponding vertically spaced apart apertures in the front vertical posts.

**10.** The shelving system of claim 1, wherein a user can withdraw the rear side support arms from the corresponding vertically spaced apart apertures in the rear vertical posts and then raise or lower the rear portion of the shelf while the front side support arms extend fully through the corresponding vertically spaced apart apertures in the front vertical posts.

**11.** The shelving system of claim 1, wherein the front side support arms are longer than the rear side support arms.

**12.** The shelving system of claim 1, wherein the front side support arms are configured to rotate to lock against the top and bottom of the corresponding vertically spaced apart apertures in the front posts if the rear side support arms are removed from the corresponding vertically spaced apart apertures in the rear vertical posts and the rear portion of the shelf is released.

**13.** The shelving system of claim 1, wherein the front and rear vertical posts are tubular in cross section.

**14.** The shelving system of claim 1, wherein the front and rear vertical posts are T-shaped, U-shaped or C-shaped in cross section.

**15.** The shelving system of claim 1, wherein the series of vertically spaced apart apertures on each of the front and rear vertical posts comprise pairs of apertures for supporting shelves on each of left



and right sides of the vertical posts.

**16.** The shelving system of claim 1, wherein the shelf is a wireframe shelf.

**17 to 20.** (canceled)

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