A shelving system that is assembled without the use of any hardware includes a first side panel extending in a vertical direction and including a first slot and a second slot that extend in a substantially horizontal direction. A second side panel is substantially parallel to the first side panel and includes a third slot opposite the first slot and a fourth slot opposite the second slot. A first shelf includes a first tongue and a second tongue. The first tongue defines a first key slot and the second tongue defines a second key slot. The first tongue extends through the first slot and the second tongue extends through the second slot to couple the first shelf, the first side panel and the second side panel. A first key is positioned within the first key slot and a second key is positioned within the second key slot.
HARDWARELESS SHELVING SYSTEM

RELATED APPLICATIONS

[0001] This application claims priority to co-pending U.S. Provisional Patent Application No. 61/617,905 filed on Mar. 30, 2012, the entire content of which are incorporated herein by reference.

BACKGROUND

[0002] The present invention relates to shelving systems. More particularly, the invention relates to shelving systems that can be assembled and disassembled without the use of hardware.

[0003] Shelving systems are often sold in a disassembled state so that they can be efficiently packaged and transported. The shelving system is then assembled by the end user for use. These systems typically require the user to have certain tools on hand to attach brackets, fasteners, and other hardware that holds the parts of the shelving system together.

SUMMARY

[0004] In one embodiment, the invention provides a shelving system that can be assembled without the use of any specialized tools and in preferred constructions without the use of any tools or hardware whatsoever. The shelving system can be arranged into multiple different configurations including various numbers of shelves.

[0005] In one construction, the invention provides a shelving system that is assembled without the use of any hardware. The shelving system includes a first side panel extending in a vertical direction and including a first slot and a second slot that extend in a substantially horizontal direction. A second side panel is substantially parallel to the first side panel and includes a third slot opposite the first slot and a fourth slot opposite the second slot. A first shelf includes a first tongue extending from a first end of the first shelf and a second tongue extending from a second end of the first shelf. The first tongue defines a first key slot and the second tongue defines a second key slot. The first tongue extends through the first slot and the second tongue extends through the second slot to couple the first shelf, the first side panel and the second side panel. A key is positioned within the first key slot to inhibit removal of the first tongue from the first slot and a second key is positioned within the second key slot to inhibit removal of the second tongue from the second slot.

[0006] In another construction, the invention provides a shelving system that is assembled without the use of any hardware. The shelving system includes a first side panel extending in a substantially vertical direction and a second side panel arranged substantially parallel to the first side panel. A first hook member is formed as part of the first side panel and defines a first slot having an open end facing in an upward direction and a second hook member is formed as part of the second side panel and defines a second slot having an open end facing in the upward direction. The system also includes a rear panel, a third hook member formed as part of the rear panel and defining a third slot having an open end facing in a downward direction, and a fourth hook member formed as part of the rear panel and defining a fourth slot having an open end facing in the downward direction. The third hook engages the first hook and the fourth hook engages the second hook to interlock the first side panel, the second side panel, and the rear panel such that the first side panel and the second side panel completely support the rear panel.

[0007] In still another construction, the invention provides a shelving system that is assembled without the use of any hardware. The shelving system includes a first side panel including a first plurality of slots and a second side panel including a second plurality of slots. Each of the slots of the first plurality is disposed opposite a corresponding slot of the second plurality. The system also includes a third plurality of shelves. Each shelf includes a first tongue having a first key slot and a second tongue having a second key slot. The first tongue of each shelf is engaged with one of the first plurality of slots and the second tongue of each shelf is engaged with one of the second plurality of slots. The system also includes a fourth plurality of keys. Each key is engaged with one of the key slots to inhibit removal of the respective first tongue and second tongue from the slot in which it is engaged. Each of the first side panel, the second side panel, the third plurality of shelves and the fourth plurality of keys is a substantially planar component.

[0008] Other aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a perspective view of an assembled shelving system;
[0010] FIG. 2 is a perspective view of another shelving system;
[0011] FIG. 3 is a side view of a side panel of a shelving system;
[0012] FIG. 3a is a side view of a portion of a side panel;
[0013] FIG. 4 is an enlarged rear perspective view of a portion of the shelving system of FIG. 1;
[0014] FIG. 5 is an enlarged perspective view of a portion of a rear panel of the shelving system of FIG. 1;
[0015] FIG. 6 is a top view of a shelf of the shelving system of FIG. 1;
[0016] FIG. 7 is a perspective view of a back portion of the shelving system of FIG. 1 with the rear panel replaced with a diagonal member;
[0017] FIG. 8 is an enlarged view of an end of the diagonal member of FIG. 7;
[0018] FIG. 9 is a front view of another arrangement of a shelving system;
[0019] FIG. 10 is a perspective view of yet another arrangement of a shelving system; and
[0020] FIG. 11 is a perspective view of a construction of a shelving system similar to that of FIG. 9 with additional diagonal members similar to that of FIG. 7.

DETAILED DESCRIPTION

[0021] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of "including," "comprising," or "having" and variations thereof herein is meant to encompass the items...
listed thereafter and equivalents thereof as well as additional items. Unless specified or limited otherwise, the terms “mounted,” “connected,” “supported,” and “coupled” and variations thereof are used broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, “connected” and “coupled” are not restricted to physical or mechanical connections or couplings.

[0022] FIGS. 1 and 2 illustrate assembled hardwareless shelving systems 10 and 10a that are well suited to holding objects such as books, CDs, DVDs, and other components commonly placed on shelves. The illustrated shelving system 10, 10a includes two side panels 15, a back panel 20, six shelves 25, and a number of locking keys 30 that when assembled define a shelving unit 10, 10a with six shelves 25. Of course, other arrangements including more or fewer shelves 25 are envisioned and could be employed depending in the desired shelving application.

[0023] All of the components of the shelving systems 10, 10a of FIGS. 1-2 are formed from plywood or other suitable panel type materials and are assembled without the use of fasteners or hardware such as nails, screws, bolts, glue, adhesives, brackets, and the like. Thus, a single material such as plywood could be employed to build and assemble the complete system 10, 10a illustrated in FIGS. 1 and 2. The system 10, 10a described herein are referred to as “hardwareless”. Hardwareless means that the systems 10, 10a can be assembled using only the building materials used for the structural components. Components such as screws, bolts, nails, brackets, adhesives or any other common fastening device are not needed and are not used.

[0024] FIG. 3 illustrates a side panel 15a similar to the ones employed in the construction of FIGS. 1 and 2 with the only difference being the side panel 15a of FIG. 3 is sized for a shelving system having only four shelves 25. The side panel 15a is substantially planar and is formed from plywood or another material having suitable strength and stiffness to support the desired shelves 25. Two feet 35 are formed at the bottom of the side panel 15a to provide a base for the assembled shelving system. Four shelf slots 40 are formed in the side panel 15a and extend in a direction normal to a vertical axis 45. Each of the slots 40 is a substantially elongated oval shape with other shapes and arrangements being possible. In the illustrated construction, the shelf slots 40 are equally spaced from one another such that the shelves 25 in the assembled shelving system are equally spaced. However, other constructions could employ uneven spacing if desired.

[0025] The side panel 15a illustrated in FIG. 3 also includes two hook members 50 that are formed as part of the side panel 15a. Each hook member 50 includes an upward extending portion 55 that cooperates with the remainder of the side panel 15a to define a slot 60. In the illustrated construction, the slots 60 include a semi-cylindrical bottom surface 65 with other shapes also being possible. The construction illustrated in FIG. 3 includes two hook members 50 with more hook members 50 being possible. In some constructions, a single hook member 50 can also be used on each side. As illustrated in FIG. 3a, another construction of the side panel 156 extends the bottom portion of the panel 156 from the bottom most hook 50 to the feet 35. This provides additional strength and stability when the shelf system is assembled.

[0026] As is best illustrated in FIGS. 1 and 5, the back panel 20 is substantially rectangular and is sized to cover the area behind the shelves 25. The back panel 20 includes a plurality of back hook members 70 that each includes a downward extending portion 75 that cooperates with the remainder of the back panel to define a slot 80. The slot 80 is similar to the slot 60 in the side panels 15 and includes a top surface 85. The back panel 20 includes the same number of hooks 70 on each side as are included in the side panels 15. Thus, the construction illustrated in FIGS. 1 and 2 includes three hook members 70 on each side of the back panel 20 that are positioned to engage with each of three hook members 50 formed as part of the two side panels 15. In some constructions, the direction of the hooks 50, 70 on the side panels 15 and the back panel 20 are reversed.

[0027] In some constructions, the back panel 20 is not required. In these constructions, a diagonal member 300 can be employed rather than using a thicker back portion as illustrated in FIG. 7. The diagonal member 300 includes two hook members 305 that are similar to the hook members 70 of the back panel 20. In some constructions, the diagonal portion 300 is used in conjunction with a back panel to allow for the use of a thinner and lighter back panel 20. In preferred constructions, the diagonal member 300 can be used in place of the back panel 20. These constructions have the added benefit that, when disassembled, the parts can be fit in smaller packaging, thereby facilitating storage and shipping.

[0028] With reference to FIG. 6, each of the shelf panels 25 is formed from a panel material such as plywood and includes a central shelf portion 90, a first end tongue 95 formed on one end of the shelf and a second end tongue 100 formed on the opposite end of the shelf 25. The first end tongue 95 and the second end tongue 100 are substantially the same to allow the shelf 25 to be installed in either direction.

[0029] Each shelf tongue 95, 100 includes a planar portion that is narrower than the central shelf portion 90 such that the central shelf portion 90 defines a shoulder 105. A slot 110 is formed in the tongue portion 95, 100 and includes a first surface 112 that is spaced a first distance 115 from the shoulder 105. The first distance 115 is selected to match or closely match the thickness of the side panels 15 to provide a tight fit as will be discussed below. In the illustrated construction, the slot 110 is an elongated oval with other shapes and arrangements being possible.

[0030] With reference to FIG. 4, the locking keys 30 engage the shelf slots 110 to couple the shelves 25 to the side panels 15. Each of the locking keys 30 is substantially mushroom shaped and thus includes a key portion 120 and a head portion 125. The key portion 120 is sized to fit within the shelf slots 110 and the head portion 125 is sized to inhibit the passage of the locking key 30 through the slot 110.

[0031] With reference to FIG. 1, the manufacture and assembly of the shelving system 10 will be described. Each of the side panels 15 is first formed with the desired number of hooks 50 and shelf slots 40. The hooks 50 and slots 40 are sized to match the thickness of the panels being used. Thus, if ¼ inch (18 mm) plywood is employed, each of the slots 40 is sized to receive a ¼ inch (18 mm) component. In some constructions, different sized materials are used for the different components. In these constructions, each slot 40 and hook 50 must be sized and positioned for the selected size of the components to which it interfaces.

[0032] Each of the shelves 25 is manufactured by forming the tongue portions 95, 100 on each end and by adding the slots 110 in the correct position. Similarly, the back panel 20 is formed with the desired number of hooks 70 positioned as required to engage the side panels 15. Finally, the key por-
To assemble the shelf system 10, the user first engages the first tongue 95 of the shelves 25 with their corresponding slots 40 in one of the side panels 15. When the shelf 25 is properly positioned, the shoulder 105 will abut the inner surface of the side panel 15 and the first surface 112 of the slot 110 will extend just beyond the outer surface of the side panel 15. One of the key members 30 is then inserted into the slot 110 to couple the shelf 25 and the side panel 15. Next, the user positions the second side panel 15 to engage the second tongues 100 in a manner similar to that described with regard to the first side panel 15. Key members 30 are inserted in the slots 110 of the second tongues 100 to couple the second side panel 15 to the shelves 25 and the first side panel 15. The assembly is completed by engaging the hooks 70 of the back panel 20 with the hooks 50 of the side panels 15.

It should be noted that other constructions of the shelving system could employ elongated key members 30 as illustrated in FIG. 2. The elongated key members 30a extend through two or more shelves 25 to reduce the total number of components.

FIGS. 9-11 illustrate other arrangements of the shelving system. FIG. 9 illustrates an arrangement 350 of the shelving system that includes multiple shelves at multiple different levels with the different levelled shelves arranged adjacent one another. FIG. 10 illustrates another arrangement 360 of the shelving system that includes only two shelves 365.

As can be seen, each shelf 365 includes two tongue portions 95 on each side of the shelf, thereby facilitating a wider shelf 365. As is illustrated in FIG. 10, a single U-shaped key 370 engages both tongue portions 95 to hold the shelves 365 in place. Of course, other key arrangements such as those illustrated herein could be employed if desired. FIG. 11 illustrates an arrangement 380 similar to that of FIG. 9 with the addition of diagonal members 385 similar to that of FIG. 7. The diagonal members 385 provide additional support for the shelf arrangement 380 without using a solid back. In addition, because a large back piece is not employed, the components of the arrangement 380 can be packed into a smaller container, thereby reducing the cost and difficulty of shipping the disassembled components. As one of ordinary skill will realize, many different arrangements of the shelving system can be employed and fall within the scope of the present invention.

Thus, the invention provides, among other things, a shelving system that can be easily manufactured using basic tools and that can be assembled without the use of any hardware or special tools, with preferred constructions needing no tools whatsoever for assembly.

What is claimed is:

1. A shelving system that is assembled without the use of any hardware, the shelving system comprising:
   a first side panel extending in a vertical direction and including a first slot and a second slot that extend in a substantially horizontal direction;
   a second side panel substantially parallel to the first side panel and including a third slot opposite the first slot and a fourth slot opposite the second slot;
   a first shelf including a first tongue extending from a first end of the first shelf and a second tongue extending from a second end of the first shelf, the first tongue defining a first key slot and the second tongue defining a second key slot, the first tongue extending through the first slot and the second tongue extending through the second slot to couple the first shelf, the first side panel, and the second side panel;
   a first key positioned within the first key slot to inhibit removal of the first tongue from the first slot; and
   a second key positioned within the second key slot to inhibit removal of the second tongue from the second slot.

2. The shelving system of claim 1, further comprising:
   a second shelf including a third tongue extending from a third end of the second shelf and a fourth tongue extending from a fourth end of the second shelf, the third tongue defining a third key slot and the fourth tongue defining a fourth key slot, the third tongue extending through the third slot and the fourth tongue extending through the fourth slot to couple the second shelf, the first side panel, and the second side panel;
   a third key positioned within the third key slot to inhibit removal of the third tongue from the third slot; and
   a fourth key positioned within the fourth key slot to inhibit removal of the fourth tongue from the fourth slot.

3. The shelving system of claim 1, wherein the first side panel, the second side panel, the first shelf, the first key, and the second key are each substantially planar components.

4. The shelving system of claim 1, wherein the first tongue defines a shoulder and wherein the distance from the shoulder to an innermost edge that partially defines the key slot is substantially equal to a thickness of the first side panel.

5. The shelving system of claim 1, wherein each of the keys is substantially mushroom-shaped to define a head portion that is larger than the key slot and a key portion that is sized to be received within the key slot.

6. The shelving system of claim 1, further comprising a first hook member formed as part of the first side panel and defining a first slot having an open end facing in an upward direction and a second hook member formed as part of the second side panel and defining a second slot having an open end facing in the upward direction.

7. The shelving system of claim 6, wherein the entire first panel and the first hook member are disposed substantially within a first plane and the entire second panel and the second hook member are disposed substantially within a second plane.

8. The shelving system of claim 6, further comprising a rear panel having a third hook member and a fourth hook member, the third hook member coupled to the first hook member and the fourth hook member coupled to the second hook member to interlock the first side panel, the second side panel, and the rear panel such that the first side panel and the second side panel completely support the rear panel.

9. The shelving system of claim 8, wherein the first side panel and the second side panel define an area therebetween, and wherein the rear panel covers substantially the entire area.

10. A shelving system that is assembled without the use of any hardware, the shelving system comprising:
   a first side panel extending in a substantially vertical direction;
   a second side panel arranged substantially parallel to the first side panel;
   a first hook member formed as part of the first side panel and defining a first slot having an open end facing in an upward direction;
a second hook member formed as part of the second side panel and defining a second slot having an open end facing in the upward direction;
a rear panel;
a third hook member formed as part of the rear panel and defining a third slot having an open end facing in a downward direction; and
a fourth hook member formed as part of the rear panel and defining a fourth slot having an open end facing in the downward direction, wherein the third hook engages the first hook and the fourth hook engages the second hook to interlock the first side panel, the second side panel, and the rear panel such that the first side panel and the second side panel completely support the rear panel.

11. The shelving system of claim 10, wherein the first side panel and the second side panel define an area therebetween, and wherein the rear panel covers substantially the entire area.

12. The shelving system of claim 10, wherein the first hook member is positioned at a first vertical position and the second hook member is positioned at a second vertical position different than the first vertical position, and wherein the first hook member and the second hook member cooperate to completely support the rear panel in the vertical direction.

13. The shelving system of claim 10, wherein the first side panel defines a plurality of first slots and the second side panel defines a corresponding plurality of second slots.

14. The shelving system of claim 13, further comprising a shelf including a first tongue sized to engage one of the plurality of first slots and a second tongue sized to engage one of the plurality of second slots.

15. The shelving system of claim 14, further comprising a first key coupled to the first tongue to inhibit removal of the first tongue from the one of the plurality of first slots and a second key coupled to the second tongue to inhibit removal of the second tongue from the one of the plurality of second slots.

16. The shelving system of claim 14, wherein the first side panel is substantially planar and resides substantially within a first plane, the back panel is substantially planar and resides substantially within a second plane, and the shelf is substantially planar and resides substantially within a third plane, and wherein the first plane, the second plane, and the third plane are arranged normal to one another.

17. The shelving system of claim 13, further comprising a plurality of shelves, each shelf including a first tongue sized to engage one of the plurality of first slots and a second tongue sized to engage one of the plurality of second slots.

18. The shelving system of claim 17, wherein the first tongue of each of the plurality of shelves defines a first key slot and the second tongue of each of the plurality of shelves defines a second key slot.

19. The shelving system of claim 17, further comprising a plurality of keys, each key received in one of the first key slots and the second key slots.

20. A shelving system that is assembled without the use of any hardware, the shelving system consisting essentially of:
a first side panel including a first plurality of slots;
a second side panel including a second plurality of slots, wherein each of the slots of the first plurality is disposed opposite a corresponding slot of the second plurality;
a third plurality of shelves, wherein each shelf includes a first tongue having a first key slot and a second tongue having a second key slot, the first tongue of each shelf engaged with one of the first plurality of slots and the second tongue of each shelf engaged with one of the second plurality of slots;
a fourth plurality of keys each engaged with one of the key slots to inhibit removal of the respective first tongue and second tongue from the slot in which it is engaged,
wherein each of the first side panel, the second side panel, the third plurality of shelves and the fourth plurality of keys is a substantially planar component.