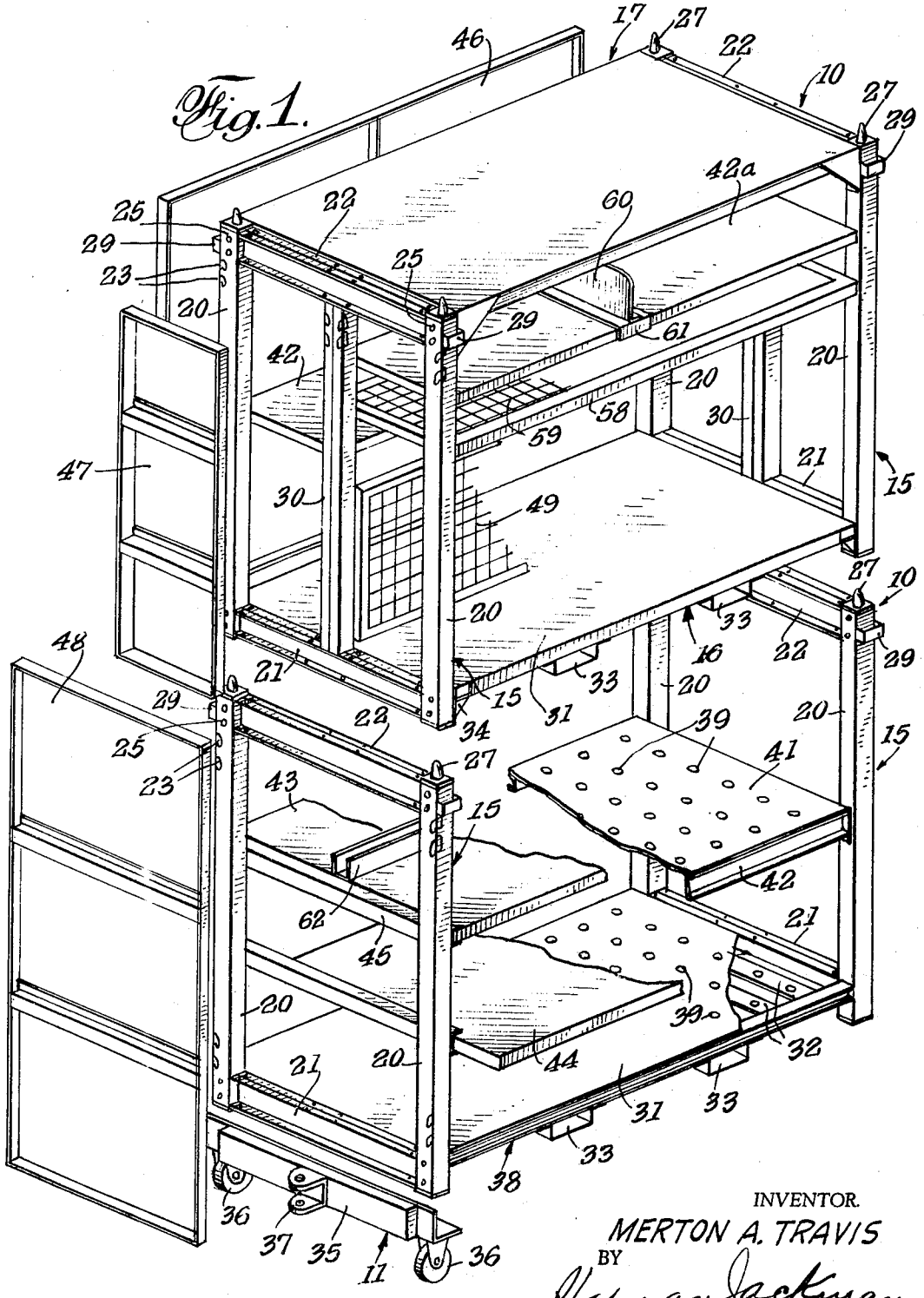
April 14, 1970 M. A. TRAVIS 3,506,138

STORAGE RACK SYSTEM

Filed April 3, 1968 2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

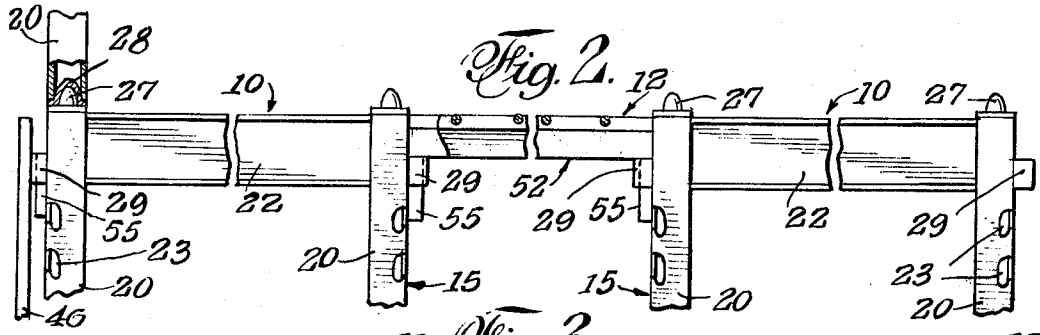


Fig. 3.

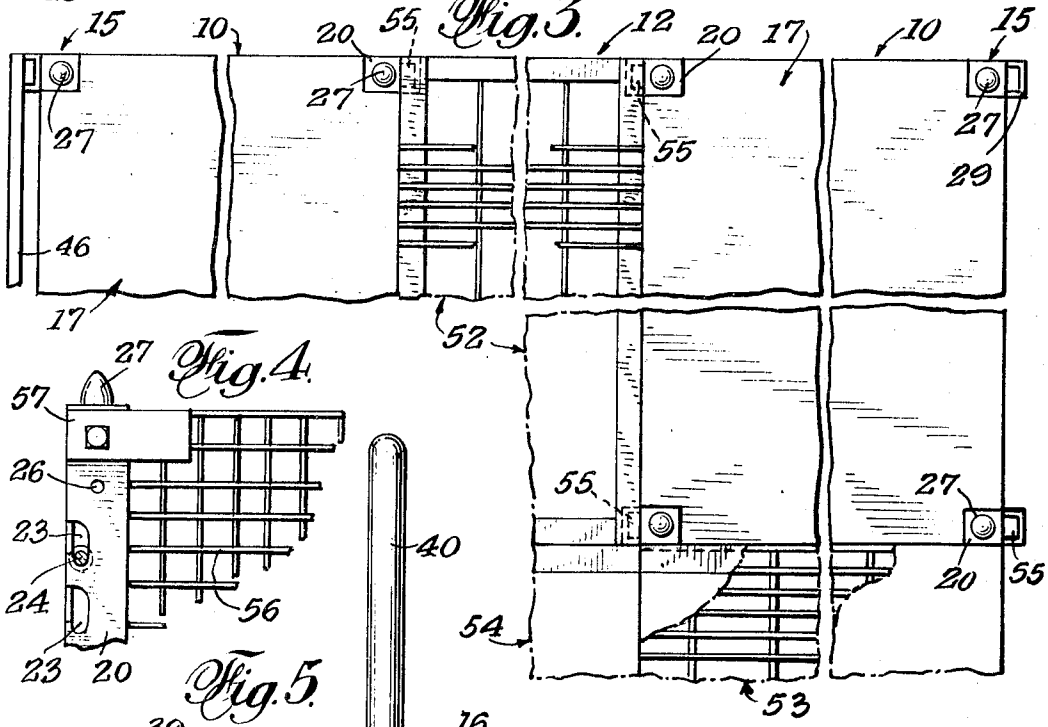


Fig. 4.

Fig. 5.

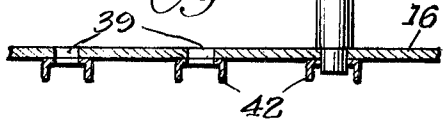


Fig. 6.

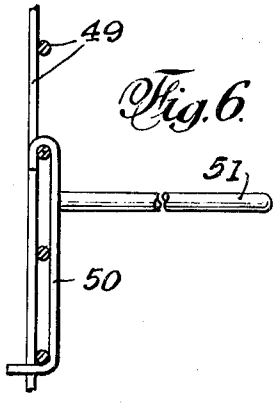
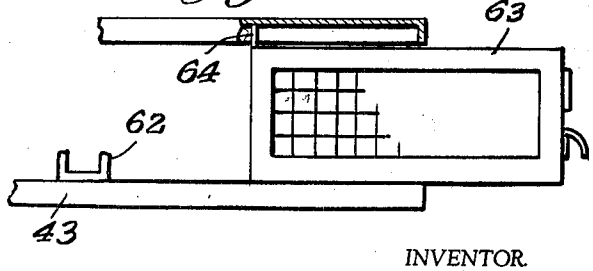


Fig. 7.



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STORAGE RACK SYSTEM

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Int. Cl. A47f 5/10
U.S. Cl. 211—148 8 Claims

ABSTRACT OF THE DISCLOSURE

A system of storage racks comprising basic rack frame components, supplemental elements assembleable on said components in various ways to form a variety of interior segregated and protective storage areas for items of various sizes and shapes, means to connect such basic rack frame components in stacked relation, and means to form walkways between adjacent stacked components and connecting the stacks of components at different levels thereof to provide accessibility to stored items.

BACKGROUND OF THE INVENTION

In large industrial plants in which a multiplicity of items are assembled and the speed and facility of assembly are in a large measure dependent on the flow of the different items to the points of assembly of, for instance, an automated assembly line, compact and easy-to-reach storage of such items promotes economy of handling. Also, the ability to economically increase storage space and rearrange the spaces of storage, as requirements demand, is an additional factor in the handling and transport of stored items. Accordingly it is an object of the present invention to provide a storage rack system of the character referred to that provides for compact and easy-to-reach storage of items, to provide for economical rearrangement of the storage spaces, and, generally, to promote economy and flexibility of storing, reaching and moving items used in the construction of machines, vehicles and other finished products.

This invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description, which is based on the accompanying drawings. However, said drawings merely show, and the following description merely describes, one embodiment of the present invention, which is given by way of illustration or example only.

SUMMARY OF THE INVENTION

The system according to the present invention comprises multiple-story configurations that erect multi-level stockrooms with ready access to each level and the storage areas within each level, without the necessity of any conventional structure framing. Various installations, either single-level or multi-level, may be rearranged to different physical dimensions and plan, including conversion from single- to multi-level or vice versa, by disconnecting and rearranging the components. The interior arrangement of shelves and attachments within each storage rack frame is immediately adjustable, rearrangeable and removable. The attachment of such shelves and attachments is accomplished by a unique arrangement of a pin and notch (as illustrated in applicant's Patent No. 3,120,200, dated Feb. 4, 1964), allowing disengagement of one side support of any rack frame without removal of the opposite side support thereof, allowing such shelf or attachment to be elevated or lowered into vertical notches alternately from side to side (walking) without removing the material stored on the shelf or attachment. The pin and notch arrangement also permits the adjustment of shelves and attachments by mechanical means (fork-lift truck) by a simple upward and rearward movement for removal, and a simple forward and downward movement for replacement. Individual storage rack frames may be provided with means for movement by lift truck, overhead hoist and tow tractor-trailer, thereby converting the storage rack frame to a transportable material-delivery unit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view showing the components and supplemental elements of two storage rack frames in stacked or tiered relation, according to the present invention.

FIG. 2 is an enlarged, fragmentary and broken end view of the upper portion of two such rack frames and the manner of their connection to form a walkway therebetween.

FIG. 3 is a fragmentary anr broken plan view of the arrangement of FIG. 2 and also showing a walkway extending transversely from the walkway shown in FIG. 2.

FIG. 4 is a fragmentary end view of a closure for an aisle formed between aligned stacks or tiers of storage racks.

FIG. 5 is a similarly enlarged sectional detail view of an item-holding peg for shelf mounting.

FIG. 6 is an enlarged sectional detail view of an item-holding peg for vertical grid mounting.

FIG. 7 is a similarly enlarged sectional detail view of an item-holding drawer for shelf mounting.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present storage rack system comprises, generally, a plurality of similar but not necessarily identical rack frame components **10** adapted to be arranged singly in both longitudinal and transverse spaced relation on the same level, as well as in similarly spaced stacks or tiers, means **11** to facilitate movement of said frame components along a surface, whether in single or stacked relation, and a walkway **12** between and connecting the spaced frame components or stacks thereof, as the case may be.

Each rack frame component **10** is shown as comprising a rectangular frame **15**, one at each end, a base shelf **16** connecting the lower portions of the frames **15**, and a top shelf **17** connecting the upper portions of a single component **10** as well as the upper portion of an upper component of a stack of components.

Each frame **15** is shown as comprising two vertical hollow posts **20** that, at their lower ends are connected by a crosspiece **21** to which the ends of the base shelf **16** are secured, as by bolts, and at their upper ends are connected by a crosspiece **22** to which the ends of the top shelf **17** (if one is used) are similarly secured.

Said posts, wherever the same may be required, are provided with bayonet slots **23**, as best shown in FIG. 4, according to the teachings of the mentioned Patent No. 3,120,200, for separable connection by headed studs **24**. The crosspieces **21** and **22** may be provided with prepared bolt holes **25** for connection of hereinafter-described panels, grids and the like. The posts **20** may also be provided with bolt holes **26** for similar reasons. As best shown at the upper left of FIG. 2, the upper end of each

post **20** is provided with a male member **27** and the lower end with a female member or socket **28**, thereby enabling two aligned posts **20** of two frames **15** to be non-displaceably connected merely by seating the socket **28** onto the member **27**. Said posts are provided, as shown, with outwardly directed stirrups **29**.

As shown in the upper portion of FIG. **1**, the end frames **15**, between the crosspieces **21** and **22**, may be provided with vertical central posts or columns **30**.

It will be understood that the slots **23** may be provided in such manner that either side of a component **10** is the front thereof, or such slots **23** may be placed so either side may be the front. This manner of slot location is carried out also when the post **30** is used, thereby dividing the component **10** so that half-depth shelves and attachments may be mounted from either side of the component, thereby providing a double-sided assembly.

The base shelf **16** is shown as a flat-decked assembly comprising a plate **31** with under-side reinforcing members **32** and provided with integral enclosures **33** for lift-truck forks and corner gusset assemblies **34** which attach to end frame posts **20** by means of bolts inserted in the gusset assemblies.

The top shelf **17** is shown as a flat-decked assembly with under-side reinforcing and corner gusset assemblies which attach to end frame posts **20**, as for the base shelf.

The connections between the posts **20** and the shelves **16** and **17** have not been detailed since the same may be accomplished in many different and non-patentable ways.

The above-described frame components **10**, as can be seen, comprise basic storage modular rack components that are capable of being moved, unitarily, by fork-lift trucks. As in FIG. **1**, means **11**, shown as attachments to the lower portions of both end frames **15**, may be provided for traction so the same may be moved over a surface from place to place. Said means **11** is shown as a tow bar **35** mounted on wheels **36** and adapted to be bolted to the lower ends of the posts **20** to be made part of the frame **15** at each end of the component **10**. A bracket **37** on the bar **35** may be pulled by any suitable truck or power vehicle.

The assembly of end frames **15** with a top and bottom shelf makes up the basic storage module rack. Such units can be moved individually by fork-lift truck or on wheels, if being used as material-transport units. The basic storage module rack is the "starter" unit **10** if being used as a storage unit. A single unit **10** is placed in position and successive top and bottom shelves and end frames are added to form a longitudinal row. When a second basic "starter" unit is tiered atop the first by means of the elements **27** and **28**, it becomes the first unit of the second level, with successive top and bottom shelves and end frames being added as before, each end frame tiering atop the one below, forming a second-level longitudinal row. In this manner, storerooms may be erected with several longitudinal rows, one or more levels high, interconnected with walkways **12**. The assembled basic unit is a unique rigid structural frame having the required compressive and lateral strength to support units tiered above along with side-mounted walkways, catwalks and stairs. This rigid frame does not depend upon the interior shelves or attachments between the top and bottom shelves to contribute structural stability, as is the case with commercial racks and shelving presently available, nor is supplemental structural framing required for multi-level installations. The interior of each unit, between the top and bottom shelves, is "open" for the mounting of a multiplicity of adjustable shelves and attachments for storing material in a protective and segregated manner.

It will be clear that each component **10** comprises a storage rack of parallelepipedon form in that the same has parallel top and bottom, parallel front and rear, and parallel ends.

Each of the frame components **10** may be provided with a variety of supplemental or auxiliary elements, some alike and some different, but each of the purpose of housing and/or defining storage space for various items, as hereinbefore explained.

One such element is shown as a peg base shelf **38** which replaces the base shelf **16** and is structurally similar to the latter. Said shelf **38** has a top plate **31** that, in this case, has a multiplicity of holes **39** to receive vertical pegs **40** to provide segregated storage for thin items.

Another such element is shown as a peg shelf **41** with similar holes **39**, but mounted on the posts **20** of the end frames **15** to be vertically adjustable according to which slots **23** of said posts are engaged by the studs **24** provided on the ends of said shelf.

Other adjustable flat-decked shelves **42**, **42***a* and **43**, with integral under-side reinforcing and a single mounting pin **24** at each corner to engage the bayonet slots **23** in the end frame posts **20**, in the same manner as described in the mentioned patent, may be provided. These pins are of a dimension to permit endwise movement "play" in the slot when mounted, thereby allowing one end of the shelf to be disengaged and moved upward or downward and re-engaged into the next slot above or below without disengaging the other end of the shelf. By such alternating disengagement and re-engagement, a shelf, loaded or empty, can be adjusted to a different level with a minimum of effort. A shelf can also be disengaged entirely by lifting at the central portion and moving it outward then upward or downward to another level, and re-engaged by an inward and downward movement. This adjustability provides for continual and flexible use of the available space for storage.

If desired, one side of each rack frame **10** may be enclosed by a cover **46**. One or both ends of each frame may be enclosed by either a cover **47** for the half-width frame, or a cover **48** for a full-width frame. Such covers, without invention, may be replaced by large-mesh grids, depending on whether ventilated or tightly closed conditions are desired. The mentioned holes **25** may be used for bolts to mount such covers.

Also, a sliding shelf **44**, similar to shelf **43** but without the corner mounting pins **24**, may be slidingly mounted into guides **45** on either side in a manner similar to a drawer in supporting slide-guides. The guides are channel-shaped and may contain anti-friction rollers and close-fitting mounting pins which engage the end frame post slots to mount the guides horizontally between the front and rear end frame posts. Such guides may be mounted in pairs to support the sliding shelf **44**, allowing it to be moved outward and inward for placing or removing material.

A center grid **49**, comprising a coarse wire mesh enclosed in a frame, having single mounting pins **24** on the corners similar to the adjustable shelf **43**, may be mounted in the same way as the adjustable shelf **43**, but is vertically rather than horizontally disposed, as shown. The mounted grid provides a vertical mesh surface which, as shown in FIG. **6**, will support hangers **50** from which pegs **51** extend horizontally and from which items having holes or contours can be stored in a hanging position. The grid peg **51** is a steel rod assembled to the flat hanger bracket **50**, made to engage and hang from a horizontal grid wire of the center grid while being restricted from sidewise movement by the vertical wires, thereby providing a rigid support for items stored by hanging as described above.

The walkway **12** is shown as comprising rectangular mezzanine gratings **52**, **53** and **54**. These mezzanine grating components are framed walkway grating units designed to attach to rack end frames **15** to provide longitudinal and transverse walkways or aisles between racks or rows of racks in multi-level installations, as the floors of a multi-story building. Grating **52** provides a longitudinal walkway between racks **10** and has four downwardly directed corner mounting lugs **55** which engage

the lifting stirrup **29** at the top of the end frame posts **20** leveling with the elevation of the top shelf of the rack unit. Grating **53** mounts between rack units **10** in the end frame depth direction, bolting to the threaded holes **25** in the top of the end frame posts **20**, providing transverse walkways or aisles transverse to the aisles formed by the grating **52**. Grating **54** is a filler section attaching to grating **52** where transverse and longitudinal walkways or aisles intersect. Any of the gratings **52**, **53** or **54** may also be mounted externally of the stacks of units, with supporting posts, to provide an external catwalk at the end perimeters of a multi-level installation.

The walkway grids may be placed at any desired level, but preferably at levels corresponding to the levels of jointure at which two stacked frame components **10** are located. Thus, the walkways serve as floors from which easy access to the storage areas of the components **10** may be had.

Stairway or ladder access to the walkways or catwalks may be provided, without invention, by securing the upper ends of such access means to the outer edges of either grating **52**, **53**, or both. The end of any aisle may be closed off for safety purposes. To this end, a closure grid **56**, shown in FIG. 4, may by means of lugs **57** thereon be bolted to the upper and lower ends of adjacent posts **20**.

Another item-supporting and -storing element may take the form of an adjustable grid shelf **58**, the wire mesh **59** providing means adapted for engagement by hooks to which members to be stored are hung. The shelf **58** may be mounted in a rack frame component **10** in any of the manners described for mounting the shelves **42**, **42***a*, **41**, **43** or **44**.

As shown in FIG. 1, a transverse shelf divider **60** may be provided on any of the above-mentioned shelves so items of different sizes and/or characteristics may be stored on spaces of a shelf divided by such a divider. While but one divider is shown as mounted on shelf **42***a*, two or more may be provided and mounted on slides **61** so the storage spaces may be adjusted for size.

Any of the above shelves, as shown in FIGS. 1 and 7, may be provided with a longitudinally arranged drawer stop **62** to limit the retracted position of an item-storing drawer **63** slidingly supported on such a shelf. FIG. 7 shows such a drawer partly pulled open. A stop lug **64** on the drawer may engage a front lip on a shelf thereabove to limit drawer projection.

While the foregoing has illustrated and described what is now contemplated to be the best mode of carrying out the invention, the construction is, of course, subject to modification without departing from the spirit and scope of the invention. Therefore, it is not desired to restrict the invention to the particular form of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. A storage rack frame component comprising:

(a) two rectangular and vertical end frames, each comprising a pair of side posts, and post-connecting transverse crosspieces located, respectively, at the upper and lower ends of said posts,

(b) a base shelf extending between and connecting the lower portions of said end frames, the lowermost surface of said shelf being spaced above the lower ends of said side posts,

(c) a top shelf extending between and connecting the upper portions of said end frames, the top surface of said top shelf being substantially level with the upper ends of the side posts,

(d) an upwardly directed tapered extension fixedly secured to the upper end of each post, and

(e) a socket in the lower end of each post,

(f) the extensions being adapted to be fitted into the sockets of a similar frame component in registered disposition thereabove, and

(g) the sockets being adapted to receive the projections of a similar frame component in registered disposition therebelow.

2. A storage frame component according to claim **1**, provided with item-storing shelves between the base and top shelf and means to separably connect the ends of said storing shelves to the end frames.

3. A storage frame component according to claim **2** in which each end frame is provided with a wheel-provided tow member at the lower end thereof, said member comprising a tow bar longitudinally coextensive with the width of each said end frame and affixed thereto, and support wheels for said bar,

4. A storage frame component according to claim **2** in which separable cover members are provided for at least one side of the frame component to enclose said side.

5. A storage rack system comprising:

(a) a plurality of rack frame components, each of parallelepipedon form,

(b) a plurality of item-storing elements mounted within the interior space formed by the six sides of each said component,

(c) means provided at the four upper and the four lower corners of each said component adapted for separable stacked connection between two components disposed, one upon the other in vertical register with each other,

(d) a walkway between spaced stacks of components and connected thereto to provide supports for persons to give access to the items stored in the components,

(e) each walkway comprising horizontally disposed members to support persons moving between the rack frame components, and

(f) means to connect said members along at least one edge thereof to an adjacent side of a rack frame component.

6. A storage system according to claim **5** in which the stacks of rack frame components are arranged in plural rows of stacks with the stacks of the several rows in transverse alignment, the walkways comprising grids arranged to form continuous aisles between the several stacks of rack frame components.

7. A storage system according to claim **6** in which the end of at least one aisle is provided with a closure grid.

8. A storage rack system according to claim **5** in which:

(a) the edges of the grids that engage the sides of the rack frame components are provided with downwardly directed mounting lugs, and

(b) said sides of the rack frame components are stirrups into which said lugs are fitted to thereby support the grids.

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