Sept. 19, 1961 R. D. COOPER 3,000,061

STORAGE BUILDING CONSTRUCTION

Original Filed May 18, 1955 2 Sheets-Sheet 1

Fig. 2.

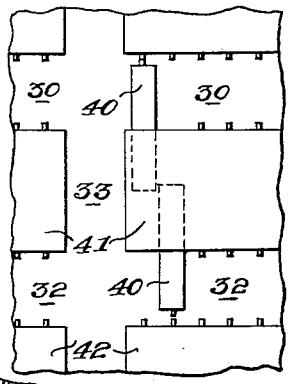
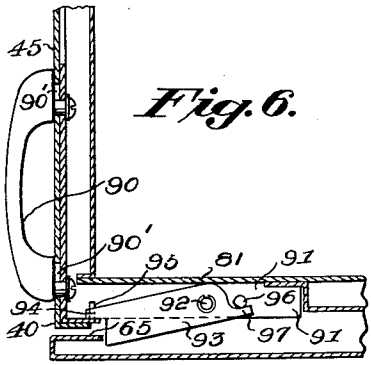


Fig. 6.



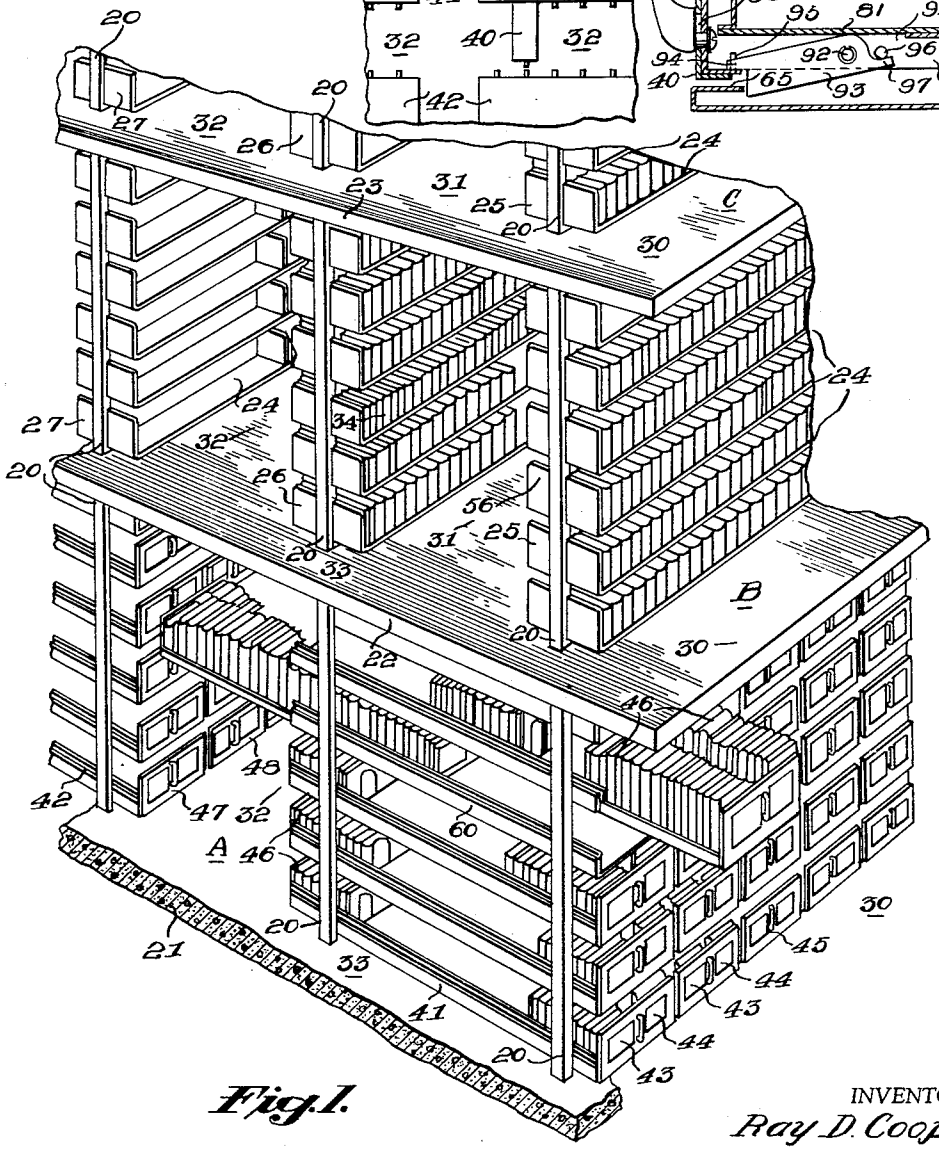


Fig. 1.

INVENTOR.
Ray D. Cooper.
BY
A. Donham Owen

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Fig. 3.

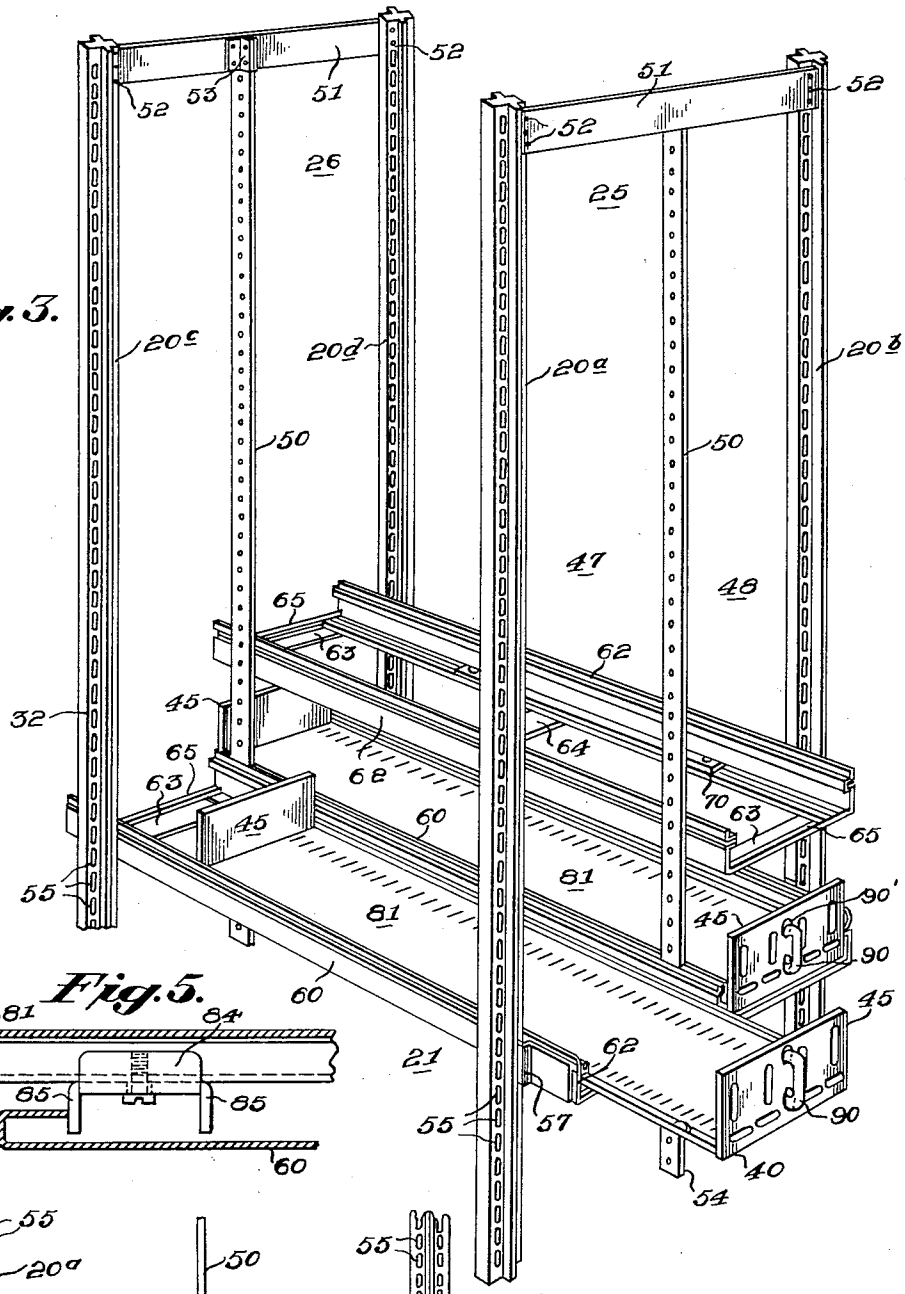


Fig. 5.

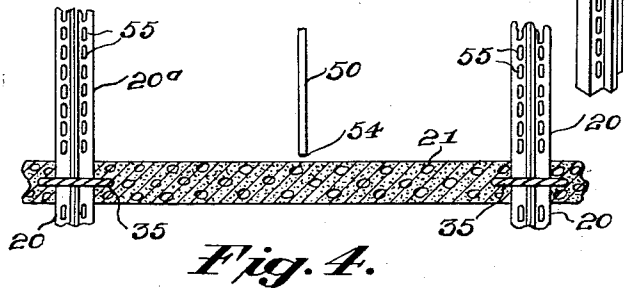


Fig. 4.

INVENTOR.
Ray D. Cooper.
BY
A. D. Graham Owen

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3,000,061

STORAGE BUILDING CONSTRUCTION

Ray D. Cooper, Mountain View, Calif.
(705 Raymundo, Los Altos, Calif.)

Original application May 18, 1955, Ser. No. 509,232, now Patent No. 2,872,048, dated Feb. 3, 1959. Divided and this application Nov. 24, 1958, Ser. No. 775,846
3 Claims. (Cl. 20—1)

This invention relates to improvements in a storage building construction, and more particularly to means for suspending a novel framework for supporting novel drawer type book storage units. This application is a division of my co-pending application, Serial No. 509,232, filed May 18, 1955, now Patent No. 2,872,048, dated February 3, 1959, which application is a continuation-in-part of my application Serial No. 248,087, filed September 24, 1951, now abandoned.

This invention solves the problem that practically every expanding library is faced with sooner or later—the need for more book storage space than conventional storage arrangements are able to supply. Since floor area and building volume are not readily enlarged and often cannot be enlarged at all, space must be gained by a reconstitution of the storage facilities themselves. The problem has existed for a long time, and many attempts have been made to meet it, but heretofore none of these attempts proved satisfactory.

One of the principal objects of this invention is to provide a novel arrangement enabling the storage of many more books in the same floor area and same total volume of stack space than was possible with the shelving heretofore in use. In fact, my invention makes it possible to store about twice as many books in a given amount of room as could be stored heretofore.

Another object of the invention is to achieve this remarkable increase in storage capacity without having to reconstruct the library building, or even the stacks. The problems which must be met in achieving this second object are less known and less obvious than the problems encountered in achieving the first object. They may be better understood after a brief consideration of the two general types of library shelving: free-standing shelving and multi-tier construction. The base of free-standing shelving rests on the floor; the shelving can be moved from place to place, because it forms no part of the supporting structure for the floors above. The load of books on free-standing shelves is supported by the floor, with the aid of the building frame. While free-standing shelving is quite practical for small libraries and low buildings, it has not proved practical for large libraries; partly because it has entailed expensive construction, including very strong floors, due to the tremendous load that the floors and floor beams must support.

To meet the load problem, most large libraries have adopted what is known as multi-tier bookstack construction. In multi-tier construction the columns only of each tier support the full load of the shelving and books for their tier, equally important, the columns of each tier are in line with the columns of the tiers above and below, and so carry the load of the floors above, as well as that of the books and bookstacks. While the columns may be continuous, extending through the floors and several stories high, this is not the way they are normally constructed. Instead, the steel columns of each tier are embedded in the concrete of their deck floor and extend up in supporting engagement with the ceiling. Consequently, the column above transmits its pressure through the floor to the column directly below. This relatively inexpensive construction accomplishes the desired result: namely, support by the columns of practically the entire load and transmission of that load down to the base or foundation of the building. The deck floors support only foot traffic and other comparatively light loads; therefore the floors can be made relatively inexpensively, the tremendous weight of the books being carried directly on the steel columns. Since the columns for multi-tier book stacks are embedded in the floor, they cannot be moved from place to place, and a problem that must be met in extending the storage capacity of existing libraries is to provide a structure that (1) uses the multi-tier columns to support the added loads and (2) does not place any additional load on the floors.

The present invention solves this problem by using the columns already in place as the sole support for the load of books. In fact, the book drawers and associated parts may be removed from one group of columns and re-installed on other columns in the book-stack area, and shelves may be re-installed on the columns in the areas vacated by the drawers.

Thus, another object of the invention is to provide a drawer-type of storage construction that is interchangeable, for most applications, with standard shelving.

It should not be thought, however, that the present invention is applicable only to multi-tier construction, for it can be used with free-standing columns. Nor should it be thought that its use is confined only to replacement of existing stacks; it is equally useful in new installations for providing more storage space per building volume.

It will be helpful in considering this invention to define some of the terminology employed in library engineering. A series of shelves supported by a series of columns along substantially a single vertical plane is called a range or a storage range. Each storage range is separated from the next storage range by a range aisle, that gives access to the books on the shelves on both sides of the aisle. Perpendicular to a series of range aisles are one or more end aisles or cross aisles or both, providing access to each of the range aisles.

The present invention is characterized by the use of a novel type of sliding drawer mounted for movement parallel to the cross aisles. All the drawers are supported by the original columns, and each range of drawers occupies the space formerly taken by two storage ranges of shelves and the range aisle in between. In other words, instead of the range aisles alternating with the column ranges, there are two column ranges for each range aisle, with the drawers extending across each group of two column ranges.

In this invention, each drawer extends the full width of the drawer range and is adapted to be pulled halfway out from each side; i.e., from each of the two range aisles on each side of the drawer range, to give access to one-half of the books from one range aisle and one-half of the books from the other range aisle. This structure helps to achieve another object of the invention, which is to give effortless trouble-free operation of the drawers. Such a drawer may, and often does, hold 250 pounds of books, yet by using the principles of my invention, the drawer can be opened and closed easily and quietly with less than a three-pound pull. I also provide novel latch means for preventing the drawers from overrunning their course when they are closed, so that they do not slide out into the other range aisle.

While some of the main problems have been mentioned and some of the principal objects have been specified, the invention solves many other problems and achieves other objects. For example, the spacing of the height of the drawers relative to each other is fully adjustable to the various sizes of books.

Further objects and advantages will appear from the following detailed description taken with accompanying drawings forming a part of this specification.

In the drawings:

FIG. 1 is a view in perspective somewhat diagrammatic in nature, showing a portion of a multi-tier library stack having one level constructed according to the principles of the present invention, and standard book shelving installed on two other levels, illustrating how the present invention adapts itself to existing installations and is convertible with standard shelving.

FIG. 2 is a plan view of a tier of bookstacks constructed according to the present invention.

FIG. 3 is a perspective view showing the installation of one tier of drawers between two pairs of columns, with most of the drawers removed in order to show the construction better.

FIG. 4 is a fragmentary view in elevation of the bottom end of the tier of FIG. 3.

FIG. 5 is a fragmentary sectional view showing the means preventing over opening of a drawer; and

FIG. 6 is a fragmentary longitudinal view showing the means to prevent the drawer going past closed position.

FIGS. 1 and 2 show a portion of a library provided with multi-tier book-stacks. On each level a plurality of columns **20** are disposed in ranges and extend from the floor to the ceiling of each tier. The lower ends of the columns **20** for the bottom tier A are embedded in or secured to a floor **21**, and their upper ends are embedded in and support a ceiling **22**, which is also the floor of the next tier B. There, the columns **20** are embedded in their floor **22** and are embedded in and support the ceiling **23**, which is the floor of tier C above. Each column **20** of each upper tier is directly in line with a column **20** of the tier below, so that so far as the resolution of forces is concerned, the columns **20** give the same result as a continuous column (cf. FIG. 4).

In the conventional book-stack on tier B, the columns **20** support double-faced shelves **24**, which provide a series of ranges **25**, **26**, and **27**, etc., extending transversely in FIGS. 1 and 2 with range aisles **30**, **31** and **32**, etc., alternating between the ranges. Access to the range aisles **30**, **31** and **32** is gained from a cross aisle **33**. Note that the shelves **24** hold only two rows of books **34**, one on each side, and that only two rows are accessible from each range aisle **30**, **31**, and **32**.

The extra load storage arrangement of the present invention is shown on tier A. It utilizes exactly the same arrangement of columns **20**, but the load storage members or drawers **40** span what had been every other range aisle **31**, the drawers being arranged in ranges **41**, **42** and leaving half as many range aisles **30** and **32**. Each drawer **40** is so constructed that it can be opened from both sides, i.e., from either of the two range aisles **30** and **32** between which it lies. Each drawer **40** opens only half way into any one range aisle **30** or **32**, since the books **34** on the other half of the drawer **40** are accessible from the other range aisle **32** or **30**. It should now be apparent how the present invention doubles the storage capacity of the illustrated stacks.

Use of the book drawers **40** is no more difficult than use of the shelves **24**. The user locates the proper drawer **40**, using the index cards **43** and **44** on the front face **45** of each drawer **40** to help him. If the book he wants is indexed on a left-hand card **43**, he stands on the left side of the drawer **40** when he opens it; if the book is indexed on a right hand drawer **44**, he stands on the right side. When he pulls out the drawer **40**, he immediately has before him the row **46** of books which includes the one he desires.

With the foregoing explanation of the broad idea of the present invention in mind, we can now pass to a detailed exposition of my preferred construction, referring first to FIG. 3. Four columns are shown, two columns **20***a* and **20***b* are in one column range **25**, and two columns **20***c* and **20***d* are in another column range **26**. The drawers **40** span what would be a range aisle **31** in shelving construction, and access to them is had from the range aisles **30** and **32**. In multi-tier construction, columns (e.g., **20***a* and **20***b*) are normally spaced approximately 3 feet apart in the same range, and approximately 5 feet separates the column ranges **25** and **26**. The 3-foot width means that it is advisable to install two tiers **47** and **48** of drawers **40** between successive columns **20***a* and **20***b* or **20***c* and **20***d* of the same range, and this is to be done, it will be remembered, without installing any new columns or other members that would place any load on the floor **21**, which, it will be assumed, has been constructed to support only foot traffic and relatively light weights. The separation and central support of parallel tiers **47** and **48** is provided by a strap like center support **50** suspended from a load equalizing and distributing beam **51**, which in turn is attached to and supported by the columns **20**. For example, the beam **51** may be attached to the columns **20** by suitable screws **52**, and the center support **50** may be secured to the beam **51** by a bracket **53** which is bolted to both the beam **51** and the center support **50**. The two strap like center supports **50** are parallel to the columns, and the lower ends **54** are spaced above the deck floor, a short distance such as about ¼" **21** (see FIG. 4), while the columns **20** are imbedded in the concrete floor **21** and rest on broad footing plates of suitable size if they are on the bottom level; otherwise, bearing plates **35** are provided between the upper columns and the columns immediately below.

The columns **20** are normally provided with perforations **55** for the reception of adjustable brackets **56** which in turn support the shelves **24** (FIG. 1). This is taken advantage of by utilizing a similar bracket **57** with detents **58** which fit into the column slots **55** and support one side of a frame **60** for each drawer **40**. The opposite (inside) side of each frame **60** is secured by bolts **61** or by a clip to the center support **50**. When two drawers **40** of each drawer tier **47**, **48** are on the same level, as is usually the case, the same bolt will support the centerward side of the two frames **60** on the center support **50**.

The frames **60** themselves comprise two parallel side members **62**, **62** extending lengthwise across what was the range aisle **31** and braced by a transverse member **63** at each end and a transverse member **64** at the center. The end transverse members **63** are each provided with an upturned flange portion **65**.

Latch or stop means are provided on the drawers to prevent opening past the mid point, and to prevent pushing the drawer past the closed position into another aisle when closing. For preventing over opening, I provide a strike member **85** mounted on a reenforcing member **84** attached to the bottom **81** of the drawer **40**. The strike member **85** engages the transverse member **63** when the drawer **40** is about half open to prevent further opening of the drawer **40**.

Adjacent each end of the drawer **40** I provide a latch bracket **91** on the underside of the bottom **81** of the drawer. A pin **92** mounted in the bracket **91** pivotally supports a latch bar **93**. The latch bar **93** has a forwardly projecting end **94** and is gravitationally biased to engage a portion **95** operatively connected with the handle **90**, slidably mounted by means of slots **90'** on the drawer front or end **45**. A portion of the forward end of the latch bar **93** normally engages the flange **65**. A tail **97** on the latch bar **93**, to the rear of the pivot pin **92**, engages a pin **96** on the bracket **91**. When it is desired to open a drawer **40**, the handle **90** is raised by sliding upwardly on the drawer front **45**, lifting the latch bar **93** away from the flange **65**. A forward pull on the handle **90** then opens the drawer.

While I have described the invention as pertaining to a library structure, as set forth in my aforesaid Patent No. 2,872,048, it is in nowise so limited. The drawers **40** can be frames or shelves to carry any load in dead storage. The function in the structure of this invention

is the novel arrangement of structural units whereby great loads are transferred to the building foundations through the building frame work. By such an arrangement the floors need be designed only for nominal live loads.

The structure defined in my aforementioned patent is designed primarily to adopt present buildings for greater storage capacity without placing additional load on the floors. The present invention is intended as the design for a storage building structure adapted to carry great loads from the foundations without increasing floor load carrying capacity.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. In a storage building having a plurality of ranges of permanently fixed vertical structural columns supporting a plurality of floors and extending therebetween, said floors being each constructed and arranged to support and hold a normal load of foot traffic, and said columns providing the sole supporting means for each floor and the support for substantial storage loads between said floors; the improvement comprising providing a plurality of load equalizing and distributing cross beams and connecting the opposite ends of each such beam respectively to adjacent columns of each range line just below each floor above the bottom floor, providing a plurality of strap-like load supporting members, and connecting the upper end of each such strap-like storage load supporting member to a cross beam substantially midway between each pair of columns of each range to freely depend from a said beam parallel to said columns, each of said strap-like supporting members being of a length less than the distance between opposed floors and having its lower free end terminating short of the floor toward which it extends, said ranges comprising a series in which each two adjacent ranges comprise a pair of ranges, a plurality of pairs of horizontal substantially rectangular load

storage members arranged in tiers in vertically spaced relation on each side of said depending strap-like members and between columns of alternate pairs of ranges, means slidably supporting the parallel sides of said load storage members respectively from said columns and from said depending strap-like members in spaced relation to the floor, whereby each series of tiers of load carrying members bridges only alternate pairs of ranges providing traffic aisles between said pairs of ranges into which said load carrying frame members may be selectively projected from said alternate pairs of ranges.

2. The structure as defined in claim 1, wherein the means slidably supporting the parallel sides of the load storage members comprises pairs of rectangular frame members, each having one side thereof connecting adjacent columns of different ranges in alternate pairs thereof, and the opposite side thereof connecting two strap-like load supporting members in alternate pairs.

3. In a building structure, a plurality of floors, a series of columns extending vertically and being arranged in substantially parallel ranges, each range and its next adjacent range comprising a pair of ranges, the columns constituting the sole support of the floors, means for carrying dead storage loads to the foot of the columns comprising beams adjacent the lower surface of each floor above its first, each beam connecting two adjacent columns of a range, load supporting members suspended from each beam between the successive columns of each range and terminating short of the floor, load carrying means tying together the columns of alternate pairs of ranges and the load supporting members of each such pair of ranges, said load carrying means being arranged in spaced apart vertical tiers in side by side relation, the arrangement providing traffic aisles between such alternate pairs of ranges.

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