

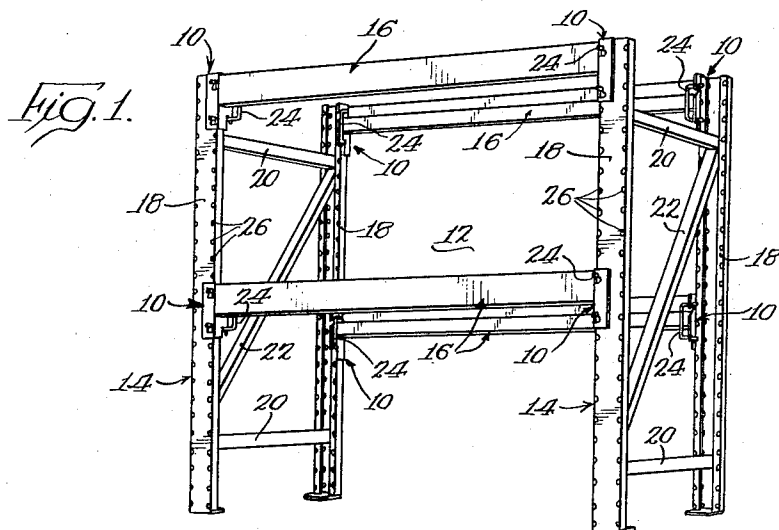
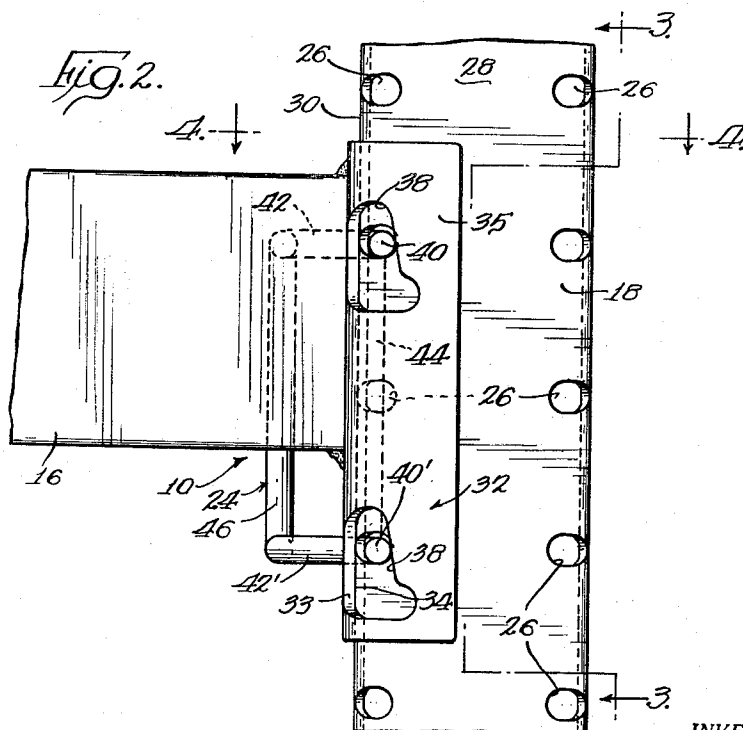
April 12, 1960

B. E. SCHELL, JR
STRUCTURAL LOCK

2,932,368

Filed June 15, 1956

3 Sheets-Sheet 1



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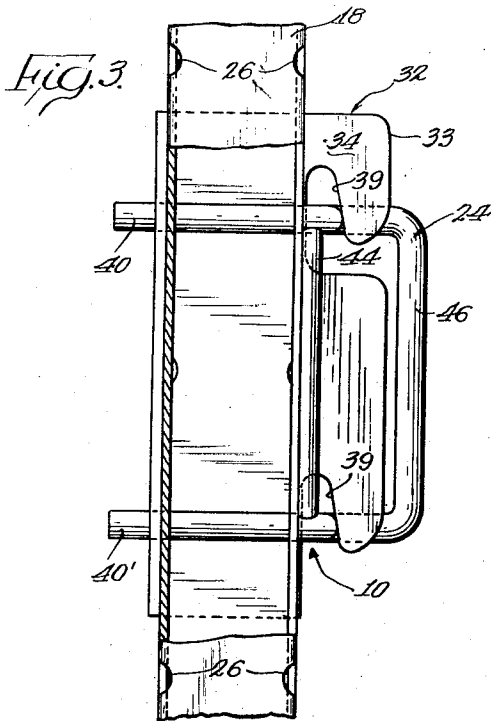
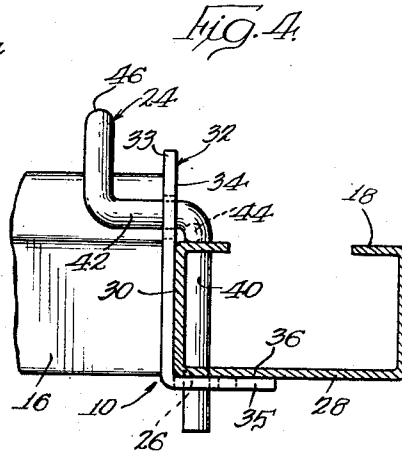
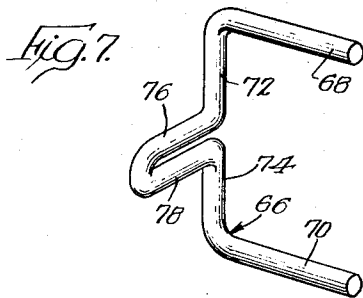
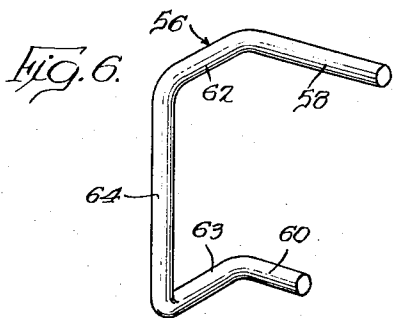
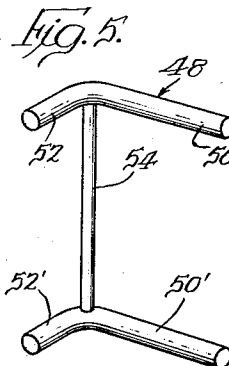
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3 Sheets-Sheet 2



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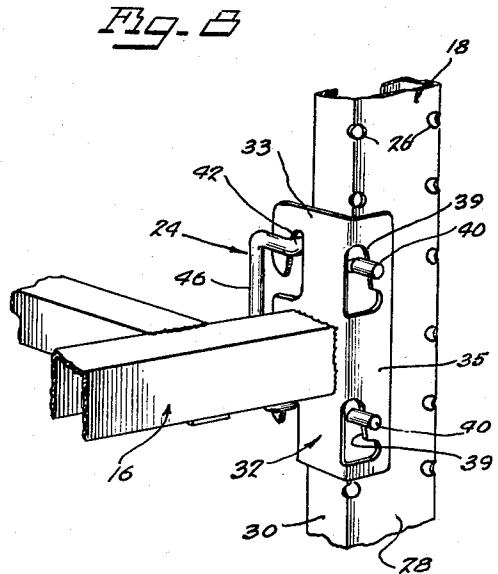
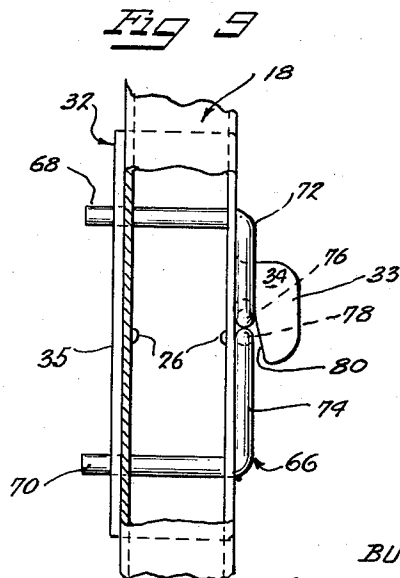
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3 Sheets-Sheet 3



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2,932,368

STRUCTURAL LOCK

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4 Claims. (Cl. 189—36)

The present invention relates generally to means for connecting structural members and, more particularly, to a lock for connecting structural members, which lock firmly connects the structural members together and permits the connected structural members to be readily separated.

It is often desirable that certain structures, such as scaffolds, storage racks, storage bins, etc., be readily assembled and disassembled so as to provide a structure which can accommodate goods of various shapes and dimensions. It is also desirable, in many instances, that such structure be readily broken-down and reassembled.

Various assembleable structures have been heretofore provided to accomplish the foregoing and the sections from which such structures have been built have been held together by various lock arrangements. However, the previously known locks have often been weak and the members have often not been securely held in place. The resultant structure therefore is often weak and unstable. Other locks provided heretofore were of a type such that the structure was difficult to assemble and knock-down, and it was often necessary to employ special tools to assemble or dismantle the structure.

The present invention provides for a simple structural lock which is readily releasable and yet holds the structural members firmly in place so that the resultant structure has strength and steadiness.

A principal object of the present invention is to provide an improved lock for structures to permit ready assembly and dismantling. Another object is to provide a lock for use in structures of the type mentioned which is strong and which firmly holds the structural members in place. A further object is to provide a lock which is readily releasable without the use of special tools and which permits ready removal or adjustment of the associated structural members. A still further object is to provide a storage rack which is relatively simple to manufacture, durable and economical.

Further objects and advantages will be readily apparent as the disclosure progresses with reference to the accompanying drawings, wherein:

Figure 1 is a perspective view of a collapsible storage rack employing the structural locks of the present invention.

Figure 2 is a fragmentary, enlarged front view of one of the locks used in the structure shown in Figure 1 with the structural members firmly locked in position.

Figure 3 is a fragmentary side view, partially in cross-section, taken along line 3—3 of the lock shown in Figure 2.

Figure 4 is also a fragmentary top view, partially in cross-section, taken along line 4—4 of the lock shown in Figure 2.

Figures 5, 6 and 7 illustrate various shaped pins for use in the lock of the invention.

Figure 8 is an enlarged perspective view of a portion of Figure 1 showing the engagement of the lock illustrated in Figures 2, 3, and 4.

2

Figure 9 is a view similar to Figure 3 showing a modification adapted for the receipt of the locking pin shown in Figure 7.

The lock of the present invention is associated with a structural member which is connected to another member in abutting relation. The two structural members are held together by the lock which releasably engages both of the structural members when they are in abutting relation. The lock, therefore, is the link holding the two structural members together. The lock secures the structural members against relative movement in two directions, as will become more clear hereinafter.

Referring now to the drawings, the lock 10 is shown in the construction of an adjustable, knock-down storage rack 12. The storage rack 12 includes two upright end frames, designated generally by the numeral 14, to which are connected four horizontally extending beams 16 which can provide support for pallets, shelving, etc. Each of the end frames 14 includes a pair of vertically extending columns 18 which are generally C-shaped in cross-section. The end frames also include a pair of horizontally extending spacing members 20 and a cross brace 22. The spacing members 20 and the cross brace 22 are fixed, as by welding, to the columns 18.

The beams 16 are in end abutting relation to the columns 18 and are secured thereto by the lock 10 of the invention.

The columns 18, as indicated, are C-shaped, in cross-section, and this shape is preferred since it has high strength and low weight per unit length. Other cross-sectional shapes may be used, however, and the vertical members may have elliptical cross-section, square cross section, triangular cross-section, or a cross section of any other suitable shape.

In the preferred constructions the columns 18 have at least two vertically extending flat surfaces 28 and 30 which are at substantially right angles to each other since such a shape provides for efficient locking of the beams 16 to the columns 18 through the lock 10.

The columns 18 have a plurality of horizontally aligned and vertically spaced holes 26 extending through the columns 18. The holes are shown vertically aligned along both edges of the inside and outside faces of the columns 18. However, the outermost, vertically aligned holes are not necessary for the rack shown but may be utilized for supporting other beams. If it is desired to build a rack that does not provide for vertical adjustment of the beams, only one set of aligned holes need be provided in the columns 18.

The beams 16 may be constructed with any suitable cross section. However, in the illustrated embodiment the beam is H-shaped, in cross-section, which provides support for a shelf or the like and tends to provide a more rigid beam.

The lock 10 includes a pin 24 and an angle plate 32 which is welded or otherwise attached to the ends of the beams 16. The angle plate has one leg 33 having a face 34. The face 34 abuts the inner and rearwardly extending face 30 of the columns 18. The angle plate 32 includes a second leg 35 having a face 36 which abuts the outer face 28 of the columns 18.

The contour of the faces 34 and 36 of the angle plate 32 conforms to the abutting surfaces of the columns 18. Such matching makes the beams 16 and columns 18 readily put together and enables the members to be tightly locked together by the pin 24.

The leg 35 of the angle plate 32 extends longitudinally outward from the beam 16 and over the column 18. The leg 35 of the angle plate has two slots 38 formed therein which are vertically spaced and are positioned so that the slots can register with a pair of holes 26 in the column 18. As shown in Figure 2, the slots have a

cammed edge which extends upwardly and inwardly, relative to the beam, so that when the beam 16 moves downwardly the cam surface causes the beam 16 to move closer to the column 18.

The other leg 33 of angle plate 32 extends rearwardly of the column 18. The extension of the leg 33 of the angle plate 32 has a pair of open slots 39 therein and the slots are vertically spaced approximately the same as the slots 38. The open slots 39 also have a cammed edge and it is cammed upwardly and toward the beam so that as the beam 16 moves downwardly the cam surface slides on the pin 24 to pull the angle plate 32 against the column 18.

The pin 24 basically comprises an L-shaped section for engaging the slots 38 and 39 and means for securing the pin against rotation. The pin 24 is not permanently secured to either the column 18 or the beam 16, but is readily disengageable from the other portions of the lock. As shown in Figures 1 to 4, the pin 24 comprises a pin section 40 which connects to a second pin section 42, this section being generally at a right angle to the first pin section 40. In order to prevent rotation of the pin sections 40 and 42, the pin 24 is provided with similar sections 40' and 42' which are connected by means of a U-shaped section 46. The connection through U-shaped section 46 prevents the rotation of pin sections 40 and 42 as well as of pin sections 40' and 42'. A spacing member 44 is used for reinforcing purposes. The pin sections 40 and 42 coact with the slots 38 and 39, respectively, to lock the beams 16 and columns 18 in fixed relation.

In erecting the storage rack 12, such as that illustrated in Figure 1, the pin 24 is first inserted into a pair of holes 26 in the column 18 so that the pin sections 40 and 40' protrude therefrom. The beam 16 is then brought in from the outside into abutting relation with the column 18 so that the pin sections 40 and 40' extend through the slots 38 and the open slots 39 are over the pin sections 42 and 42'. The beam 16 is then moved downwardly and the cammed surfaces of slots 38 pull the member 16 into a close fit and locking position with the column 18. When the horizontal member 16 is moved downwardly, the cammed surfaces of slots 39 engage the pin element 24 and pull the angle member 32 into abutting relation with the column 18.

The lock firmly holds the column 18 to the beam 16 but the column and beam may be readily separated by raising the beam 16 upward.

With the pin 24 locking the members together in two planes which are angularly disposed, any tendency to rotate the beams or columns 16 or 18 about their longitudinal axis or about their junction is avoided and the final rack, such as rack 12, therefore has great rigidity. As will be seen from the foregoing, the beams 16 are readily assembled onto the columns 18 as the beams 16 can be applied from the front without manipulation of the pins 24 inside the columns.

Modifications of one or more of the elements of the invention may readily suggest themselves and several modifications of the pin 24 are shown in Figures 5 to 7.

Figure 5 is an embodiment of a pin 48 which may be used in the lock 10 instead of the pin 24 shown in Figures 1 to 4. The pin 48 includes a pair of pin sections 50 and 50' which correspond to pin sections 40 and 40'.

The pin 48 also has a pair of pin sections 52 and 52' which are at substantially right angles to the sections 50 and 50'. The sections 52 and 52' correspond with the sections 42 and 42'.

The sections 50 and 52, and 50' and 52' form L-shaped sections which are connected by a rod 54. The rod prevents rotation of the pin sections.

Figure 6 is also an embodiment of a pin 56 which may be used in the lock 10 instead of the pin 24 shown in Figures 1 to 4. The pin 56 has a pair of pin sections 58 and 60 which correspond to pin sections 40 and 40' of pin

24. Pin section 58 is of a sufficient length to protrude through column 18 so it can engage leg 35 of angle plate 32 at the sides of one slot 38. The lower pin section 60 is of sufficient length to extend into column 18, however, it does not protrude therefrom to engage slot 38 in angle plate 32. The pin sections 62 and 63 correspond with the sections 42 and 42'. The sections 58 and 62, and 60 and 63 form L-shaped sections which are connected by pin section 64. Pin section 64 corresponds to pin section 46 of pin 24.

Figure 7 is an embodiment of a modified pin 66. In order to use pin 66 however, the leg 33 of angle plate 32 is modified as shown in Figure 9 to include a single slot 80 in which the pin sections 76 and 78 of the pin 66 fit. The pin 66 includes a pair of pin sections 68 and 70 which correspond to pin sections 40 and 40' of pin 24. Pin section 68 is connected to pin section 76 by pin section 72 and similarly, pin section 70 is connected to pin section 78 by pin section 74. Pin sections 68, 70, 72 and 74 are in a plane which is at approximately right angles to the pin sections 76 and 78.

While there has been illustrated and described a particular form of construction embodying the invention, it is to be understood that it is not intended to thereby limit the invention. Various other modifications of the invention, without departing from the spirit thereof, will become apparent to those familiar with the art involved.

I claim:

1. Means for interconnecting disengageable structural members comprising an L-shaped locking pin having first and second pin sections disposed in generally perpendicular relation to one another, a first structural member including means releasably engaging said first pin section, a second structural member with a facing surface having two portions disposed in generally perpendicular relation to one another and in abutting engagement with said first member, one of said portions including means in releasable engagement with said first pin section, and the other of said portions including means in releasable engagement with said second pin section, and means preventing rotation of said locking pin relative to said members.

2. Means for interconnecting disengageable structural members comprising an L-shaped locking pin having first and second pin sections disposed in generally perpendicular relation to one another, a first structural member having means releasably engaging said first pin section, a second structural member with a facing surface having two portions disposed in generally perpendicular relation to one another and in abutting engagement with said first member, one of said portions having a cam-forming edge surface in releasable engagement with said first pin section and the other of said portions having a cam-forming edge surface in releasable engagement with said second pin section, and means preventing rotation of said locking pin relative to said members.

3. Means for interconnecting disengageable structural members comprising a first member having a plurality of holes located therealong, a second member having a facing surface in generally abutting engagement with said first member, said facing surface having a pair of cam-forming edges in each of a pair of portions disposed in generally perpendicular relation to each other, and a lock including a pair of L-shaped locking pins interconnected by a third pin preventing rotation of said locking pin relative to said members, each of said locking pins having a pair of pin sections disposed in generally perpendicular relation to one another, said locking pins each having one section releasably engaged with a selected one of said openings in said first member and having each of said pin sections releasably engaged by one of said cam-forming edges of said second member portions.

4. Means for interconnecting disengageable structural members comprising a first member having a plurality of openings therealong, a second member having an

5

angle plate in generally abutting engagement with said first member, said angle plate having a pair of legs each disposed at right angles to one another, each of said angle plate legs having a pair of cammed slots therein, and a lock including a pair of L-shaped locking pins interconnected by a third pin preventing rotation of said locking pin relative to said members, each of said locking pins having a pair of pin sections disposed in generally perpendicular relation to one another, said locking pins each having one pin section releasably engaged in a selected one of said openings in said first member and having each of said pin sections releasably engaged with one of said cammed slots in one of said angle plate legs.

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