

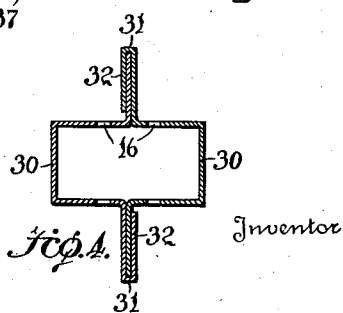
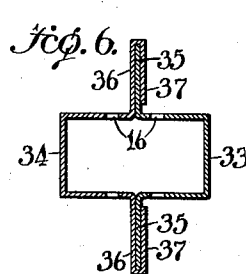
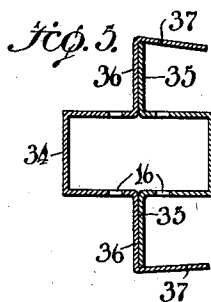
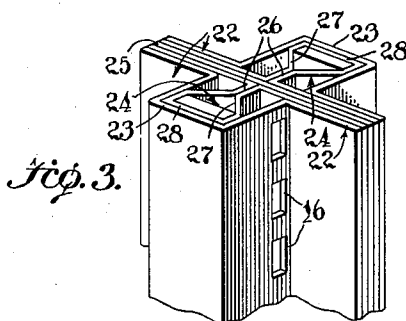
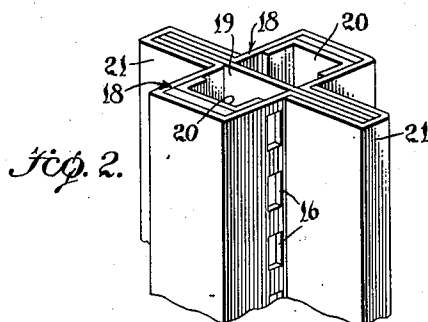
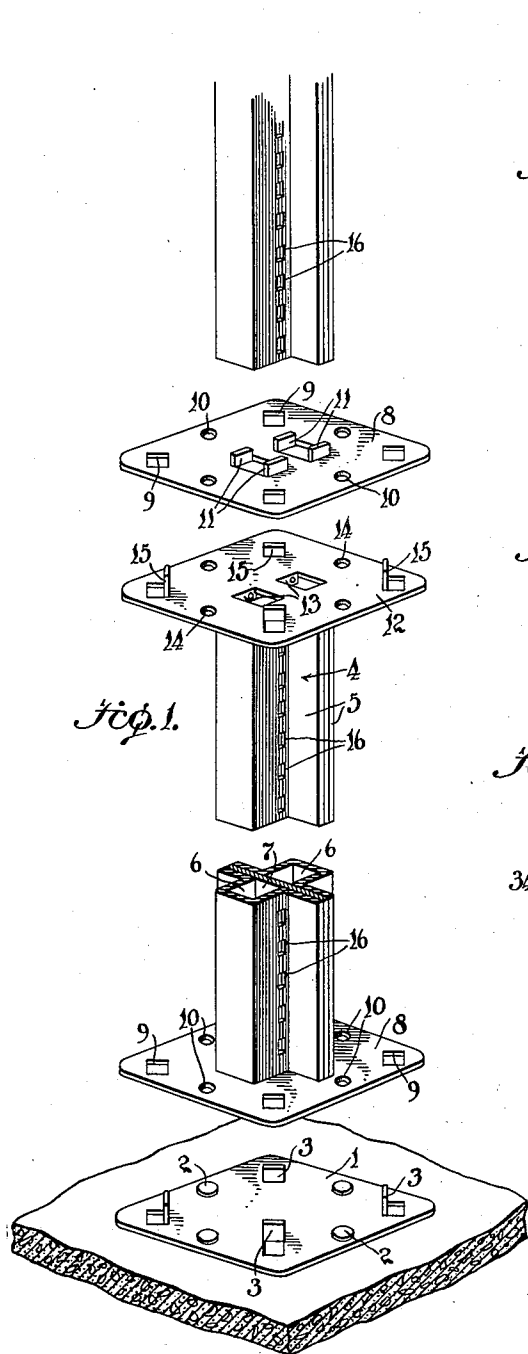
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BOOK STACK

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UNITED STATES PATENT OFFICE

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BOOK STACK

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664,575. Divided and this application March
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8 Claims. (Cl. 189—38)

This invention relates to metal columns and particularly to library book stack columns.

This application is a division of application Serial No. 664,575, filed April 5, 1933.

The invention comprehends the provision of an improved column construction formed of a plurality of sheet metal sections assembled in co-operating relation to provide a substantially uniform column structure having a substantial load carrying capacity.

The invention provides improvements in the structure of columns for book stacks wherein the exterior dimensions of the columns can be maintained substantially uniform so they may be readily spaced at predetermined distances apart to receive book shelves of standard dimension, and yet, at the same time, incorporate stress distributing structures so that the columns will carry substantial loads with a wide margin of safety. In constructing columns in this manner, the main column forming structural members remain substantially uniform while the stress distributing parts may be added to provide an assembled structure having the necessary load capacity.

The invention comprehends other features residing in the details of construction of the column members and the plate members used on the ends thereof which secure a cooperation of the parts in assembled relation that form a new column structure as pointed out in detail in the following description and claims.

In the drawing:

Fig. 1 is a disassembled perspective showing a foundation plate, a stack column member with the central portion broken away and shown in section, and a bottom plate for another stack column member disassembled from the lower end of the member, for the purpose of showing the details of construction and method of assembly of the several parts.

Fig. 2 shows a portion of a stack column member in perspective to illustrate a cross section of a stack column member having added stress distributing sections incorporated in the structure thereof.

Fig. 3 is a view similar to Fig. 2 showing a stack column member with a different type of stress distributing structure.

Figs. 4, 5 and 6 are cross sections of two other types of stack column members incorporating stress distributing sections in the assembly thereof.

The stack column members forming the subject matter of the present invention will preferably be used with foundation plates 1 as shown in Fig. 1 that are placed in position on a suitable foundation or foundation floor structure that is to be used for supporting the book stack, in advance of the erection of the stack thereon. Obviously, a

number of these foundation plates will be used, one for each of the columns used in the erection of the stack. All of these plates are located in coplanar relation on the supporting floor or foundation for the book stack in advance of the erection of the stack or the placement of any columns thereon in the manner disclosed in the copending application mentioned above.

Each foundation plate comprises a piece of sheet metal in the form of a plate having a plurality of openings for receiving suitable anchor members 2 that are suitably embedded or attached in the foundation or supporting floor for anchoring the foundation plates in fixed position. Each of these foundation plates 1 has tongues 3 formed in the corner portions extending laterally and upwardly from the plates so that in the anchored position they will appear as shown in Fig. 1. These tongues 3 provide interlocking and positioning means for accurately centering and positioning stack column members thereon, and for holding them in properly centered relation, as well as providing a means for detachably locking the column members thereto so that they will be anchored to the foundation through the medium of foundation plates 1.

Stack column members 4 of the character illustrated in the several figures of the drawing are provided by this invention for erection upon the foundation plates 1 and upon each other in end to end relation in the building of a stack structure. These column members have a length equal to the height of one floor so that one set of column members is provided for each floor.

Each column member is of duplicate form and of uniform length so as to be interchangeable and adapted for mounting upon any other column member or any foundation plate by reason of its uniform construction.

The column member 4 illustrated in Fig. 1 comprises a pair of strip members 5 having the central portions offset in opposite directions to provide channel portions 6. A stress distributing strip member 7 is interposed between strip members 5. The marginal portions of strip members 5 and strip 7 are secured together by welding or other equivalent means to provide a rigid post construction. A bottom plate 8 is mounted on each column member 4 and comprises a sheet metal plate that is substantially square and conforms in size and shape to the foundation plate 1, having openings 9 in the corner portions for receiving the tongues 3 on the foundation plate or similar tongues on a top plate to be described. The bottom plate 8 is also provided with a plurality of openings 10 to receive gauging means, not shown, or other spacing devices of a character that is described in the aforementioned copending application. Each bottom plate 8 has the central portion of the plate formed to provide op-

posite pairs of laterally extending ears 11 arranged to engage on either the inside or the outside of the channel portions 6, these ears being shown in Fig. 1 to engage on the inside of channel portions 6 so they may be suitably secured to the ends of the strip 5 in the channel portions 6, by welding, or other equivalent means.

A top plate 12 is provided on each column member and is of the same shape and size as the bottom plate, having tongues formed from the central portion thereof, indicated at 13 in Fig. 1, similar to tongues 11 on the bottom plate and extending into channel portion 6 at the upper end of column member 4 and suitably welded or otherwise secured to the strips 5, in the channel portions, to rigidly secure the top plate in position. Each top plate is provided with a plurality of openings 14 in the side edges. These openings are adapted to receive the ends of gauging members used to space columns desired distances apart in rows both longitudinally and laterally in a bookstack as described in the aforementioned application. The corner portions of each top plate are formed to provide upwardly extending tongues 15 that provide interengaging and interlocking means between one column member and an adjacent superposed column member through engaging in the openings 9 in the bottom plate of a superposed column member in a manner that can be clearly understood from the illustration in Fig. 1.

The offset portions of strips 5 forming channel portions 6 of each column member are provided adjacent to the edges of the channel portions of the strip, on each side, with a series of slots 16 extending throughout the length of each column member to receive supporting lugs carried by book shelves, not shown.

This method of mounting the book shelving on the stack column members is already well known in the art, and illustration and description thereof is therefore, believed unnecessary except to point out that in the use of uniform sized book shelving, it is necessary that the stack column members be uniformly spaced and arranged in order that the slots in each adjacent column in a row will be uniform distances apart to readily receive the book shelving which is adjustable and interchangeable in the stack structure through uniform spacing and mounting of the stack column members.

As this invention provides for the construction of book stacks including one or more floors, and may be readily used in the construction of book stacks including twenty to thirty or more floors, it will be understood that in the construction of a stack having a substantial number of floors, for example twenty, the stack columns carried by the foundation plates and forming the support for the first floor as well as carrying the load on the entire stack structure, are subjected to a substantially greater load than stack column members at the top portion of the stack structure. As a result it is found desirable in some cases to use stack column members having additional stress distributing structure incorporated therein such as the various forms illustrated in Figs. 3 to 6 inclusive, depending on the type and size of loads the column member is to carry.

The outside dimensions of the stack column incorporating such stress distributing structure will be uniform in all cases, the length of the columns will be uniform and the top and bottom plates will be of uniform size and structure. In this way the invention provides for the structure of a book stack having ample load carrying qualities

including the provision of the proper factor of safety for carrying the necessary load in all parts of the stack and at the same time providing column members of unit structure for assembly.

The column structure shown in Fig. 2 includes strip members 18 having channel portions formed in the same manner as the strip members 5 illustrated in Fig. 1. The strip members 18 are assembled in the same manner as the strip members 5 with a stress distributing strip member 19 interposed between the opposed strip members 18. Auxiliary channel shaped members 20 of sheet metal are mounted in the channel portions of the strip members 18 as shown in Fig. 2 with the opposite edge portions secured to the opposite sides of the channel portions of strip members 18 and the intermediate portion in spaced parallel relation to the offset central portion of strip members 18. In this way a stress distributing structure is obtained through the rectangular tubular structure provided by the combination of strip members 18, 19 and 20, all of these strip members extending in parallel relation throughout the length of each column member and the cross sectional illustration in Fig. 2 showing the relative transverse position of these parts.

Edge embracing strips 21 of suitable sheet metal having a channel shaped cross section are engaged over the opposite edges of strips 18 and 19 in the manner illustrated in Fig. 2, the entire structure being rigidly secured together by the welding of the several members together or through securing them in rigid assembled relation through any other suitable means so as to provide a column structure of the character clearly shown in Fig. 2. The edge embracing members 21 have been found through tests to have a high efficiency in stress distributing cooperation with strip members 18 and 19 and are also found to be highly efficient in the provision of a column member using strip members similar to members 18 but omitting the intermediate stress distributing member 19.

The stack column structure illustrated in Fig. 3 has substantial strength obtained through the use of a plurality of sheet metal strip members including a pair of strip members 22 formed to provide channel sections 23 arranged in opposed relation and having interposed therebetween a pair of longitudinally extending filler strips 24 and an intermediate flat strip member 25. The strip members 24 are positioned on opposite sides of flat strip member 25 that extends between opposite edges of the column and terminates in coincident relation with the edges of strip members 22 and 24. The central portions of strip members 24 are offset in opposite directions to provide a pair of longitudinally extending sections 26 in the central portion of the column projecting laterally from the central portion of strip member 25, these sections merging into diverging portions 27 terminating at their outer ends in channel shaped portions 28.

This structure is welded or otherwise suitably secured together at the edge portions of the respective strip members and at other points of contact if desired so that they are all united to form a rigid assembled structure. The channel portions 28 have surface contact with the channel portions 23 of strip members 22 and through the use of the diverging sections 27 and the sections 26, the column structure is provided with substantial stress distributing parts that cooperate in the assembled structure to carry a sub-

stantial weight for the type of material used without likelihood of buckling or bending.

Fig. 4 provides a stack column member having channel shaped strip members 30 of duplicate form arranged in opposed relation similar to the strip members 5. Each of the strip members 30 have marginal sections 31 on opposite sides of the channel portion. The marginal section 31 at one side has an extension 32 folded back upon section 31 in spaced parallel relation thereto, so that the marginal portion 31 having the extension 32 of each of the channel-shaped strip members 30 will receive and embrace the other marginal extension 31 of the opposite member 30. This results in providing a structure wherein a tubular post construction is obtained having a marginal section 31 and its extension 32 on each side of the channel section of the members 30 as illustrated in Fig. 4.

The sections 31 and 32 at opposite sides of the channel portions of the members 30 may be rigidly secured together in an appropriate manner, by welding or the like, to provide a rigid post construction for the column member in which the portions 31 and 32 cooperate to provide an efficient stress distributing structure in the column for carrying substantial loads. The column member constructed as shown in Fig. 4 will be provided with top and bottom plates in the same manner as illustrated in connection with the column member shown in Fig. 1.

Figs. 5 and 6 illustrate a column member constructed in a manner somewhat similar to that shown in Fig. 4. Fig. 5 illustrates the partial assembly of the structure, and Fig. 6 illustrates the column sections in complete assembled relation. Referring to Fig. 5 the column comprises channel-shaped strip members 33 and 34. The ends of channel-shaped strip member 33 are provided with lateral extensions in opposite directions indicated at 35, and channel member 34 is provided with similar laterally extending sections 36. The extensions 36 terminate in angular flange sections 37 that are folded back toward channel member 34 in the manner illustrated in Fig. 5 so that they extend in angular relation to the portion 36. This provides for the assembly of a channel member 33 with a channel member 34 by engaging flanges 35 of channel member 33 between flanges 36 and 37 of channel member 34 as illustrated in Fig. 5.

After these channel members are assembled in this manner, flanges 37 are pressed into engagement with flanges 35 of member 33 to rigidly secure the two channel members in assembled relation, the flanges 33, 36 and 37 being suitably welded or secured together in rigid assembled relation to provide a rigid post structure having similar stress distributing properties to the structure illustrated in Fig. 4, and being adapted to carry substantially large loads in comparison with the type of material used. Columns constructed as illustrated in Fig. 6 will also have top and bottom plates similar to the column illustrated in Fig. 1.

In using columns of the character above described in the building of a book stack, the columns for supporting the first floor of the book stack will be arranged in position, one on each foundation plate 1 with tongues 3 engaging through openings 9. The tongues are turned over to lock each column to each base plate.

The next set of columns above those supporting the first floor are then positioned on top of the first set of columns so that the tongues 15

on each top plate will extend through openings 9 on the bottom plate of the column next above so they may be turned over to lock the two columns together. The manner of securing this result is clearly described in the aforementioned application and can be readily appreciated from the disclosure in Fig. 1.

It will be further understood that where a book stack construction has a number of stories or decks, the weight on the lowermost group of columns will be much greater than the weight or load on the upper columns. It is therefore desirable in stacks of this character to use columns in the bottom portion of the stack that are constructed to carry the load and may, for example, be constructed similar to the columns shown in Figs. 2 and 3, while the columns in the intermediate portion of the stack may be similar to those shown in Figs. 4 and 6 or similar to that shown in Fig. 1. Due to the fact that all of these columns may be constructed so that the outer dimensions are uniform, the spacing between adjacent columns in the rows does not have to be varied in order to place the book shelves in interlocked relation with the columns through the use of the slots or openings 16, yet, adequate provision is made for carrying the widely varying load conditions applied to the columns in the bottom portion of the stack as compared with those at the top.

It is to be understood in connection with the disclosure and illustration of the several cross sections of columns as shown in the drawing and described above, that the column having the cross section shown in Fig. 1 and using the strip 7 may have the strip members 5 thereof constructed like those shown in Figs. 4 and 6, with flanges similar to those shown at 32 in Fig. 4, or 37 in Fig. 6 added to the strips 5.

It is also to be understood that channel strips 21 as shown in Fig. 2 may be used with the structure of Fig. 1 which should be obvious from Fig. 2 in view of the fact that it is clear that for some types of column structures members 20 may be omitted. Where an unusually strong column structure is desired, such as that shown in Fig. 3, it is to be further understood that members 22 may, if desired, be made in a manner similar to the structures shown in Figs. 4 and 6 should additional strength be needed in the columns having the cross section shown in Fig. 3, or channel strips similar to those shown at 21 in Fig. 2 may be used should this type of construction be preferable.

As the various arrangement of column parts described in the paragraph next above should be perfectly obvious from the foregoing description and the drawing and in view of the fact that to illustrate each one described would unnecessarily multiply the drawings, an illustration of the arrangements described in the paragraph next above have been omitted from the illustration in the drawing, but are to be understood as being comprehended by the claims.

The invention claimed is:

1. A metal column, comprising a tubular post member, a base plate and a top plate on opposite ends of said post member extending laterally to the axis thereof, said top plate being formed with a plurality of spaced, rigid and fixed positioning projections extending laterally from one side of said plate opposite to the post member and spaced outwardly from said post member, and said base plate being formed with means spaced from the post member to detach-

ably received the projections of a similar top plate on another column member to detachably engage said column members in end to end relation, said projections and means being operable to secure two columns together in end to end axially aligned relation.

2. A sheet metal column, comprising a tubular sheet metal post, sheet metal plates, each formed to provide centrally arranged laterally extending securing tongues securing said plates to opposite ends of said post, positioning tongues formed on one of said plates in spaced relation on the side of said plate opposite the post, the other of said plates having spaced apertures formed therein to receive the tongues on one of the first-mentioned plates of another post to secure a pair of posts together in axially aligned relation.

3. A sheet metal column comprising a tubular sheet metal post, polygonal sheet metal base and top plates having the central portions engaged with opposite ends of said post in laterally extending relation, securing tongues struck out of said plates extending laterally thereto and fastened to said post, laterally extending positioning tongues struck out of the corner portions of said top plate and extending laterally thereto from the side opposite the post, the base plate having corner apertures to receive the positioning tongues on the top plate of another post for securing said posts in axial aligned relation.

4. A sheet metal column, comprising a tubular sheet metal post, sheet metal plates each formed in the central portion with laterally extending means attaching said plates to opposite ends of said post, one of said plates having a plurality of lateral projections on the side opposite said post and in spaced relation from the center of said plate and each other operable to engage in complementary parts formed to receive said projections in the other plate on another post for aligning two posts in end to end relation, and aligned attaching means on each of said plates for detachably receiving gauging members adapted to align other posts in spaced parallel relation.

5. A sheet metal column, comprising a pair of elongated sheet metal strips, opposite margins of said strips being engaged in face to face contact in coincident relation and welded together, said strips having central sections offset in opposite directions, forming laterally extending spaced parallel portions connected to said margins, and spaced parallel sections joining the outer edges of said laterally extending portions to form a rectangular tubular post in cross section, said laterally extending portions having longitudinally aligned slots formed therein adjacent to said margins on each side thereof, and top and bottom plates extending transversely of the ends of said post having the central portions engaged with and secured to said post, one of said plates having positioning means formed thereon for interengagement with complementary means of the other of said plates carried by another column for aligning columns in end to end relation.

6. A sheet metal column, comprising a pair of elongated sheet metal strips, opposite margins of said strips being engaged in face to face contact in coincident relation with opposite faces of the opposite margins of another strip and welded together, said first-mentioned strips hav-

ing central sections offset in opposite directions forming laterally extending spaced parallel portions connected to said margins, and spaced parallel sections joining the outer edges of said laterally extending portions to form a rectangular tubular post in cross section having an internal reinforcing web, and end plates extending transversely on the ends of said post, having the central portions secured to the ends of said post, and means formed on one plate for interengagement with complementary means formed on the other plate on another post for positioning said posts in axial alignment.

7. A sheet metal column, comprising a plurality of elongated sheet metal strips, opposite marginal sections of said strips being engaged in face to face contact in coincident relation and integrally welded together, central sections of the outermost strips having oppositely offset portions in spaced parallel relation and laterally extending portions in spaced parallel relation joining the first-mentioned parallel portions to said marginal sections and forming a rigid tubular post, and end plates having the central portions secured to the ends of said post on opposite ends thereof, positioning projections on one end plate and apertures in the other end plate adapted to receive the positioning projections on the end plate of another post to align said posts in symmetrical relation.

8. A library stack column, comprising a plurality of elongated sheet metal strips, opposite marginal sections of said strips being engaged in face to face contact in coincident relation and integrally joined together, central sections of the outermost strips having oppositely offset portions in spaced parallel relation and laterally extending portions in spaced parallel relation joining the first-mentioned parallel portions to said marginal sections and forming a rigid tubular post, said laterally extending portions each having a row of uniformly spaced symmetrical perforations extending longitudinally thereof, each row of perforations having cooperation with a row in another post to detachably receive attaching lugs on a book shelf for adjustably and detachably mounting the book shelf on said post in supporting position in forming a library stack, and end plates having lateral extensions in the central portions secured to the ends of the outermost strips on opposite ends thereof, positioning projections on one end plate and apertures in the other end plate adapted to receive the positioning projections on the end plate of another post to align said posts in symmetrical relation whereby said laterally extending portions on each post are in alignment with said rows of perforations in alignment, and whereby said strips and end plates in assembled relation cooperate to provide a column unit structure for the construction of bookstacks, wherein the strips form the load carrying members for directly supporting the book shelves and also the floors through the medium of the end plates directing the load to the strips, said end plates cooperating to provide for the spacing of columns in a stack structure to place the rows of perforations in the strips in a fixed spaced parallel relation in adjacent rows of columns so that the book shelves may be detachably mounted on any pair of adjacent parallel columns.

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