

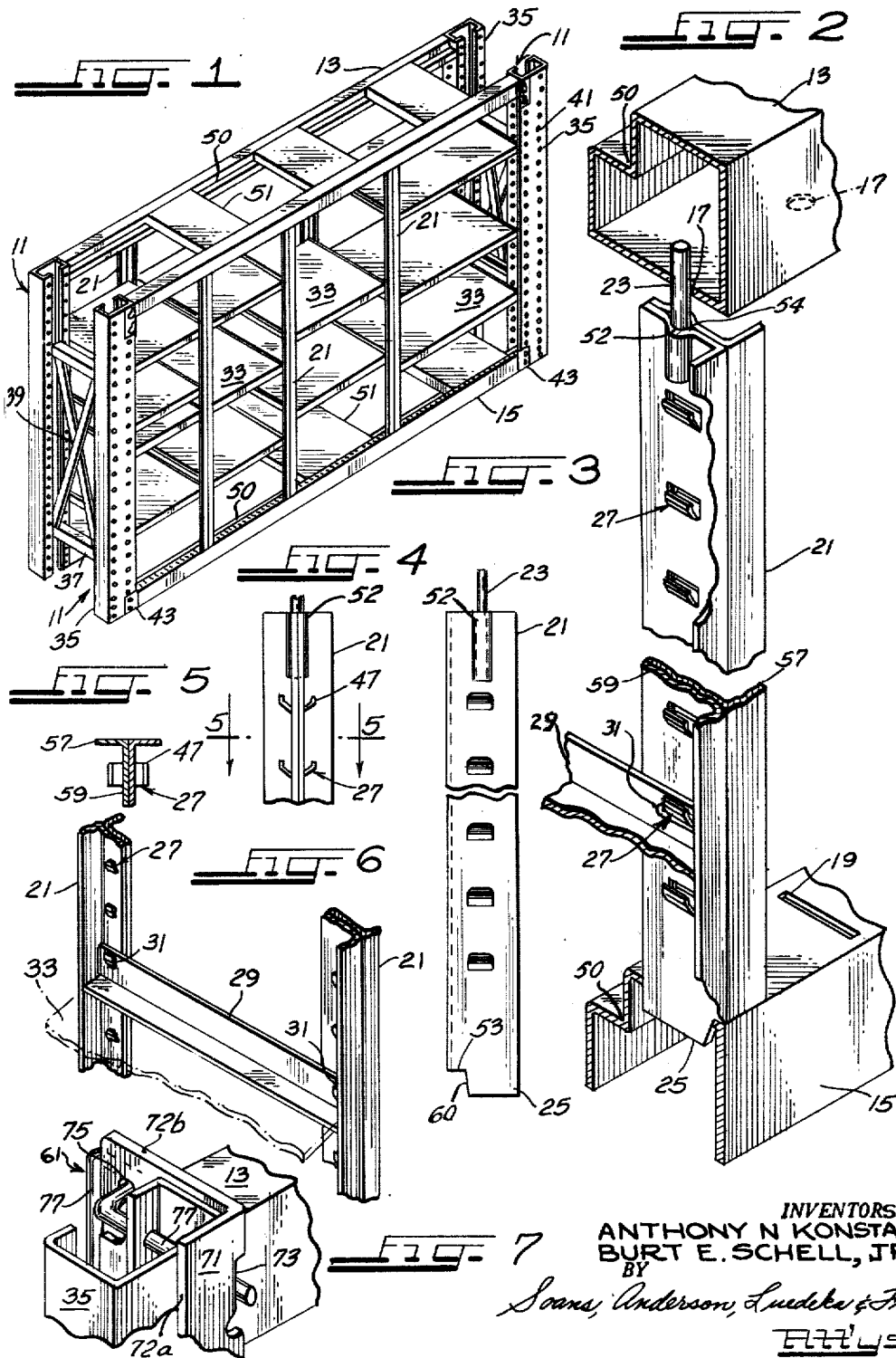
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A. N. KONSTANT ET AL

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STORAGE RACK

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INVENTORS.
ANTHONY N KONSTANT
BURT E. SCHELL, JR.
BY

Loane, Anderson, Luedke & Fitch

ATTYS.

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STORAGE RACK

Anthony N. Konstant, Mount Prospect, and Burt E. Schell, Jr., Long Grove, Ill., assignors to Speedrack Inc., Skokie, Ill., a corporation of Illinois
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The present invention relates generally to storage means and more particularly to a storage rack or structure which can be adjusted to accommodate packages or articles of various shapes and sizes.

Because of the varying inventories of industrial concerns, storage structures have always been sought which afford maximum flexibility in storage area so as to eliminate wasted storage space by effecting high density storage, i.e., the maximum amount of material in a given space. Since it often is impossible to foresee changing storage requirements, it is desirable that the storage structure be readily adaptable to efficiently accommodate new sizes and shapes of merchandise. It is desirable that these adjustments can be made quickly and simply without a complicated and time-consuming knock-down and re-building procedure. It is also often desirable for the structure to be one which is self-supporting so as to eliminate any need for placement in a specific type of location in order to attach it to the building for support.

Permanently fixed shelving is inherently incapable of achieving high density storage in an industry with a changing inventory, for wasted space appears as soon as new goods of different dimensions must be stored in a fixed bin intended for goods of another size. Storage structures have previously been designed in an attempt to eliminate this wasted space by providing vertical adjustment of storage shelves. However, these adjustments have often entailed time consuming mechanical operations while only partially solving the problem. The present invention provides for both horizontal and vertical adjustments in a manner which can be accomplished quickly and easily without the need for screws, bolts, etc.

Accordingly, the main purpose of the present invention is to provide an improved storage structure which is readily adjustable in order to selectively provide storage bins or compartments of different dimensions as needed to accommodate goods of varying shapes and sizes. Another object of the present invention is to provide a structure which is quickly and easily adjustable to new storage requirements with a minimum use of screws, bolts, etc. A further object of the invention is to provide a self-supporting, stable, durable structure constructed of a minimum number of interchangeable parts which can be assembled or disassembled without special tools, allowing placement anywhere and without regard to supplementary supporting structures.

Further objects and advantages of the present invention will be apparent from a study of the following description and accompanying drawings of one preferred embodiment of the invention in which:

FIGURE 1 is a perspective view of a preferred embodiment of the storage rack of the present invention;

FIGURE 2 is an enlarged perspective view of one of the intermediate vertical columns or posts seen in FIGURE 1, certain parts being broken away to illustrate details of the post and related structure;

FIGURE 3 is a side elevation of the post on a reduced scale;

FIGURE 4 is a partial rear view of the upper portion of the post, as seen in FIGURE 3;

FIGURE 5 is a sectional plan taken on the line 5-5 of FIGURE 4;

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FIGURE 6 is a perspective view showing one of the crosspieces which are connected between pairs of opposite posts with a shelf shown in phantom; and

FIGURE 7 is a perspective view showing the interconnection of an upper beam and a bent.

FIGURE 1 of the drawings illustrates a self-supporting structure which is the basic unit of the invention. It should be understood that although only one pair of frames 11 are shown in the drawing in order to portray the basic unit, the new storage structure may, and preferably does, include a series of any reasonable number of frames 11 spaced apart in a row covering the desired storage area.

The basic supporting structure seen in FIGURE 1 comprises a pair of upright end frames or bents 11 spaced apart and connected together by a pair of upper parallel beams 13 and a pair of lower parallel beams 15 which are preferably disengageably connected to the bents 11 to form an open rectangular framework. The beams 13, 15 contain spaced openings 17, 19, respectively, along their lengths as can be more clearly seen in FIGURE 2.

These openings 17, 19 permit the selective insertion of pairs of front and rear posts 21 between the upper 13 and lower 15 beams between the upright frames or bents 11. Crosspieces 29 (see FIGURE 6) may be selectively hung on the pairs of posts 21 by means of the support brackets 27 thereon thus providing a base for shelves 33. The bents 11 likewise are provided with support brackets 27 to accommodate horizontal crosspieces 29. The selection of varying horizontal locations for the posts 21 and different heights for the crosspieces 29 affords a multitude of over-all storage patterns, one of which is illustrated in FIGURE 1.

Each of the upright end frames or bents 11, includes a pair of spaced, front and rear vertically extending columns or channels 35, a pair of horizontal spacing members 37, and two diagonal cross-braces 39 arranged in the shape of an X. The spacing members 37 and diagonal cross-braces 39 are preferably connected, as by welding, to the vertical channels 35.

The vertical channels 35 are preferably C-shaped in horizontal cross-section and have a plurality of horizontal pairs of holes 41 extending through them with the pairs being vertically spaced. The pairs of holes 41 are also aligned in two vertical rows along both edges of the inside and outside faces of the vertical channels 35. Since vertical adjustment of the beams 13, 15 is not herein desirable, only the uppermost and lowermost sets of holes need be provided. However, complete rows of holes are provided since they reduce the weight of the structure without materially affecting its strength. As shown, only the innermost vertical sets of holes 41 are necessary for the basic unit structure comprising only two bents 11 shown in FIGURE 1. However, the outermost sets of holes are utilized when additional beams 13, 15 are used to add another unit so as to lengthen the storage structure.

The lower beams 15 are removably connected to the bottom of the vertical channels 35 by any suitable means, such as angle-plates 43 affixed to the ends of the beams 15 having holes spaced correspondingly to those in the vertical channels 35 through which bolts may be passed to interconnect them.

The upper beams 13 are releasably held in their end-abutting positions to the vertical channels 35 preferably by the structural lock 61 illustrated in FIGURE 7 and also disclosed in U.S. Patent No. 2,932,368.

The lock comprises an angle plate 71 and a locking pin 77. The angle plate 71 is affixed to the end of the upper beam preferably by welding and includes two flanges 72a, 72b which contain cammed surfaces 73 and 75, respectively, which are generally perpendicularly dis-

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posed in relation to each other. The locking pin 77 is releasably held by the holes 41 in the vertical channels 35. When the angle-plate 71 is positioned over the pin 77, downward pressure upon the beam 13 firmly interconnects the beam 13 and the vertical channel 35 as the cammed surfaces 73, 75 engage cooperating sections of the locking pin 77 as illustrated in FIGURE 7.

The beams 13, 15 may be of any suitable cross-section, but one having parallel sides is generally preferable. In the preferred construction shown, the beams 13, 15 are in the form of L-shaped box girders (see FIGURE 2). The beams 13, 15 thus provide seats 50 for sheets or sections of shelving 51 as shown in FIGURE 1, which, by extending between the front and rear beams, serve as a storage base if so desired. The bottom side of the lower beam 15 may be omitted, as shown, thereby saving weight without affecting its function.

The upper surfaces of the lower beams 15 have openings, preferably slots 19, spaced along their lengths at fixed intervals (FIGURE 2). The slots 19 are of a generally rectangular shape preferably extending transversely of the beam length, and aligned a predetermined distance from the edges of the beam 15. The bottom surfaces of the upper beams 13 contain openings, preferably round holes 17, spaced in a line along their lengths. These holes 17 are likewise set apart a fixed interval and arranged so that when the beams 13, 15 are assembled a round hole 17 will be vertically above each slotted opening 19. The line of holes 17 is a set distance from the edge of the beam 13 to allow the posts 21 to be accommodated vertically between the beams 13, 15 in any set of openings 17, 19.

The intermediate vertical posts 21 in the present embodiment, as shown in FIGURE 5 are preferably T-shaped in cross-section which has proved satisfactory to give stability and maximum storage area. The post 21 is designed to removably fit in a vertically extending position between a pair of upper 13 and lower 15 beams.

A vertically extending tenon, in the present case a circular connecting pin 23, is affixed atop the post 21 by any suitable means. In the preferred embodiment illustrated in FIGURE 2, a pocket 52 is formed in each of the angle sections so that when they are joined to form the post 21 a socket 54 for the pin 23 is provided. The pin 23 may be secured in the post 21 by any suitable means such as welding. The pin 23 has a diameter slightly less than that of the holes 17 in the upper beams 13 so that it can be removably inserted therein.

The T-shaped cross-section of the post 21 is itself used to form a flat tenon 25. The bottom of the post 21 is chamfered to leave a section of the web 59 of the T which will fit into the slots 19 in the bottom beam 15. The chamfer 60 is fashioned diagonally so that the tenon 25 will fit easily into the slot 19 while the widest part of the upper end of the tenon 25 is just slightly less than the longer dimension of the slot 19 so as to insure a stable configuration. The chamfer 60 ends at a shoulder 53 which seats upon the upper surface of the lower beam 15 thereby supporting the post 21.

The over-all length of the intermediate post 21, excluding that of the pin 23 is slightly less than the vertical distance between the bottom surface of the upper beam 13 and the top surface of the lower beam 15 to provide for easy assembly of the post 21 in the unit when the upper and lower beams remain fixed in their position.

In assembling the column, the upper tenon or pin 23 is inserted fully into the hole 17 in the upper beam 13 and the lower tenon 25, is poised above its corresponding slot 19 in the lower beam 15. The post 21 is then lowered until the shoulder 53 rests upon the top surface of the lower beam 15. The pin 23 is of a sufficient length so that it still engages the hole 17 thus restraining the post 21 from horizontal movement in any direction. As thus anchored or located, the post 21 has its flat surface, i.e., the cross-bar 57 of the T cross-section, facing outside the

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storage structure and the web 59 of the T facing inside and across.

The post 21 has, intermediate its end pieces 23, 25, a plurality of vertically spaced support brackets 27. The brackets 27 are positioned in two vertically aligned rows, and arranged in pairs one on each side of the web 59 of the post 21. The brackets or lugs 27 extend outward at an angle from the vertical surfaces of the web 59 terminating in a short bend upward forming the support pieces 47 which are generally vertical. The brackets 27 are easily fashioned by stamping them out of the surface of the web in the forming operation. The post 21 is preferably fabricated from two angle pieces which are joined, preferably by welding, to achieve the final T-shape.

Support brackets 27 of the same design as those described with respect to the post 21 are similarly punched out of, and spaced along, the side surfaces of the vertical channels 35 of the bents 11, or the brackets 27 may be formed on a separate strap which can be suitably joined to the vertical channel 35. The over-all spacing is such that when a pair of posts 21 are inserted opposite each other, one in each side of the structure, the support brackets 27 on them will lie in line with each other and in the same horizontal planes as those support brackets 27 on the bents 11. Likewise the fore-and-aft horizontal distance between support brackets 27 at the same vertical level on opposite front and rear posts 21 will equal the horizontal distance between those on different channels 35 of the same bent 11.

The load-carrying crosspieces 29, employed to support the shelves 33, are preferably angle iron pieces and of a length that will allow them to fit between the inside surfaces of crossbars 57 of opposite posts 21. The vertical surface of each crosspiece 29 contains two oblong apertures 31 so positioned that they will fit over the support ends 47 of two support brackets 27 on a pair of opposite front and rear posts 21 or on vertical channels 35 of a bent 11. When two crosspieces 29 are connected facing each other at the same vertical level, their horizontal surfaces provide the base for a storage shelf 33. As seen, the vertical spacing of the brackets 27 allows connection of the crosspieces 29 at varying heights thereby facilitating adjustment in storage space heights.

Adjustments in width of storage space can be accomplished by simply removing a pair of opposite posts 21 and replacing them at a different position along the beams 13, 15 thus increasing or decreasing the horizontal distance between crosspieces 29 as desired.

While the embodiment illustrated in FIGURE 1 uses shelves 33 to provide storage support surfaces, it is understood that crosspieces 29 with a greater horizontal width could be alone used to store rigid items, thus eliminating the need for a shelf 33. It is also understood that sheeting can be inserted between opposite posts 21, or hung from their support brackets 27, if desired, to place a partition between horizontally adjoining storage bins.

The embodiment disclosed herein may be changed or modified without departing from the scope of the invention. As another embodiment of the invention, the round holes 17 may be omitted and an elongated, longitudinally extending slot may be provided in the upper beams 13. Likewise the transversely extending slots 19 may be omitted with an elongated, longitudinally extending slot formed in the lower beams 15 as a substitute. In each such case, the tenons 23, 25 are formed to so fit into such a longitudinally extending slot, which slot has a transverse dimension proportioned to accommodate the tenons 23, 25 and thereby hold the posts 21 against transverse movement. In this embodiment, the posts 21 will be restrained from longitudinal movement by the shelves 33 or, if desired, by longitudinally extending tie-bars connected between adjacent posts 21 and between posts 21 and the columns 35 of the bents 11.

What is claimed is:

1. An arrangement for use in a storage rack provided with a plurality of front openings which are adjustable to permit insertion and withdrawal of merchandise units of different dimensions while preventing significant loss of storage capacity, which comprises (a) a pair of parallel upper and lower elongated beams positioned in superposed spaced relation, and (b) a plurality of movable normally vertical posts extending between said beams, (c) the beams each being provided with post-engaging parts along the beam, (d) the posts each being provided at each end with a beam-engaging part cooperating with and selectively engaged with said post-engaging parts of said beam so as to locate the post in a vertically extending position and to hold said posts against transverse movement, (e) said post-engaging parts being spaced longitudinally along said beams so as to allow selective relocation of said posts to define between adjacent posts a space of the desired horizontal width, (f) said pair of cooperating parts at each end of the post being relatively vertically movable so as to effect disengagement of said parts incident to the said vertical movement.

2. An arrangement for use in a storage rack provided with a plurality of front openings which are adjustable to permit insertion and withdrawal of merchandise units of different dimensions while preventing significant loss of storage capacity, which comprises (a) a pair of parallel upper and lower beams positioned in superposed spaced relation, and (b) a plurality of movable normally vertical posts extending between said beams, (c) the beams each being provided with a series of post-engaging parts spaced along the beam, (d) the posts each being provided at each end with a beam-engaging part cooperating with and selectively engaged with one of said series of beam parts so as to locate the post in a vertically extending position selectively horizontally spaced from an adjacent vertical post so as to define between said adjacent posts a space of the desired horizontal width, (e) said pair of cooperating parts at each end of the post being relatively vertically movable so as to effect disengagement of said parts incident to the said vertical movement, (f) the weight of said post serving to maintain said cooperating parts in engagement.

3. An arrangement for use in a storage rack provided with a plurality of front openings which are adjustable to permit insertion and withdrawal of merchandise units of different dimensions while preventing significant loss of storage capacity, which comprises (a) a pair of parallel upper and lower beams positioned in superposed spaced relation, and (b) a plurality of movable normally vertical posts extending between said beams, (c) the beams each being provided with a series of post-engaging parts spaced along the beam, (d) the posts each being provided at each end with a beam-engaging part cooperating with, and selectively engaged with one of the said series of beam parts so as to anchor the post in a vertically extending position selectively spaced from an adjacent vertical post so as to define between said adjacent posts a space of the desired horizontal width, (e) said pair of cooperating parts at each end of the post being relatively vertically slidable so as to effect disengagement of said parts incident to the said vertical movement, and (f) one pair of said cooperating pairs of parts being engageable over a greater vertical distance than the other pair of parts so as to effect engagement of said post one end at a time.

4. An arrangement for use in a storage rack provided with a plurality of front openings which are adjustable to permit insertion and withdrawal of merchandise units of different dimensions while preventing significant loss of storage capacity, which comprises (a) a pair of parallel upper and lower beams positioned in superposed spaced relation, and (b) a plurality of movable normally vertical posts extending between said beams, (c) the beams each being provided with a series of post-engaging open-

ings spaced along the beam, (d) the posts each being provided at each end with a beam-engaging part cooperating with and selectively engaged with one of the said series of beam openings so as to anchor the post in a vertically extending position selectively spaced from an adjacent vertical post so as to define between said adjacent posts a space of the desired horizontal width, (e) said pair of cooperating parts at each end of the post being relatively vertically slidable so as to effect disengagement of said parts incident to the said vertical movement, and (f) one pair of said cooperating pairs of parts and openings being constructed so as to generally prevent said post from rotating, thus maintaining it in a predetermined oriented position relative to said beams.

5. An arrangement for use in a storage rack provided with a plurality of front openings which are adjustable to permit insertion and withdrawal of merchandise units of different dimensions while preventing significant loss of storage capacity, which comprises (a) a pair of parallel upper and lower beams positioned in superposed spaced relation, (b) a plurality of movable normally vertical posts extending between said beams, (c) the beams each being provided with a series of post-engaging parts spaced along the beam, (d) the posts each being provided at each end with a beam-engaging part cooperating with and selectively engaged with one of the said series of beam parts so as to anchor the post in a vertically extending position selectively spaced from an adjacent vertical post so as to define between said adjacent vertical posts a space of the desired horizontal width, (e) said pair of cooperating parts at each end of the post, being relatively vertically movable so as to effect disengagement of said parts incident to the said vertical movement, (f) the posts each being also provided with a series of supporting parts vertically spaced along their lengths intermediate their ends, (g) and a plurality of horizontally extending load-carrying crosspieces, each end of which has a cooperating part selectively engaging one of said supporting parts on said post thereby interconnecting said post and said crosspiece and locating said crosspiece at a desired load-carrying height.

6. A storage rack unit provided with a plurality of front openings which are adjustable to permit insertion and withdrawal of merchandise units of different dimensions while preventing significant loss of storage capacity, which comprises (a) a pair of spaced vertical end frames, (b) front and rear pairs of parallel horizontal upper and lower beams positioned in superposed spaced relation and connecting said end frames, (c) a plurality of pairs of front and rear movable normally vertical posts extending between said beams, (d) the beams each being provided with a series of post-engaging parts spaced along the beam and (e) the posts each being provided at each end with a beam-engaging part cooperating with and selectively engaged with one of said series of beam parts so as to anchor the post in a vertically extending position selectively spaced from an adjacent vertical post so as to define between said adjacent posts a space of the desired horizontal width, (f) said pair of cooperating parts at each end of the post being relatively vertically slidable so as to effect disengagement of said parts incident to the said vertical movement, (g) the posts each being also provided with a series of supporting parts vertically spaced along their lengths intermediate their ends, (h) and a plurality of parallel horizontally rearwardly extending load-carrying crosspieces, each end of which has a cooperating part selectively engaging one of said series of supporting parts so as to connect a front and rear post and hold said crosspiece in a selected horizontally extending, fore-and-aft position between a front and rear post, said position being so selectively spaced from said adjacent horizontal crosspieces supported on said same pair of front and rear posts as to define a space of desired vertical height.

7. A storage rack unit provided with a plurality of

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front openings which are adjustable to permit insertion and withdrawal of merchandise units of different dimensions while preventing significant loss of storage capacity, which comprises (a) a pair of spaced vertical end frames, (b) front and rear pairs of parallel horizontal upper and lower elongated beams positioned in supposed spaced relation and connecting said end frames, (c) a plurality of pairs of front and rear movable normally vertical posts extending between said beams, (d) the beams each being provided with post-engaging parts therealong and (e) the posts each being provided at each end with a beam-engaging part cooperating with and engaged with said post-engaging parts of said beam so as to locate the post in a vertically extending position and to hold said posts against transverse movement, (f) said pair of cooperating parts at each end of the post being relatively vertically slidable so as to effect disengagement of said parts incident to the said vertical movement, (g) the posts each being also provided with a series of supporting parts vertically spaced along their lengths intermediate their ends, and (h) a plurality of parallel horizontally rearwardly extending load-carrying crosspieces, each end of which has a cooperating part selectively engaging one of said series of supporting parts so as to connect a front and rear post and hold said crosspiece in a selected horizontally extending, fore-and-aft position between a front and rear post, said position being so selectively spaced from said adjacent horizontal crosspieces supported on said same pair of front and rear posts as to define a space of desired vertical height, (i) said post-engaging parts being spaced longitudinally along said beams so as to allow selective relocation of said posts to define between adjacent posts a space of the desired horizontal width.

8. A storage rack unit provided with a plurality of front openings which are horizontally and vertically ad-

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justable to permit insertion and withdrawal of merchandise units of different dimensions while preventing significant loss of storage capacity, which unit comprises (a) a pair of spaced vertical end frames, (b) front and rear pairs of parallel horizontal upper and lower beams positioned in superposed spaced relation and connecting said end frames, (c) a plurality of pairs of front and rear movable normally vertical posts extending between said beams, (d) said beams each being provided with a series of post-engaging parts spaced therealong and (e) said posts each being provided at each end with a beam-engaging part selectively engaged with one of said series of beam parts so as to anchor said post in a vertically extending position selectively spaced from an adjacent vertical post so as to define between said adjacent posts a space of the desired horizontal width, (f) a series of supporting parts vertically spaced along said posts and, (g) a plurality of parallel horizontal rearwardly extending load-carrying crosspieces, (h) each of said crosspieces having cooperating parts engaging supporting parts on a pair of front and rear posts whereby said pair of posts are connected and said crosspiece is maintained in a selected horizontal fore-and-aft position, said position being so selectively spaced from adjacent crosspieces supported on said same pair of front and rear posts as to define spaces of desired vertical heights.

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