Aug. 10, 1965 L. ORSI 3,199,471

COLLAPSIBLE SHELVINGS

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FIG. 2

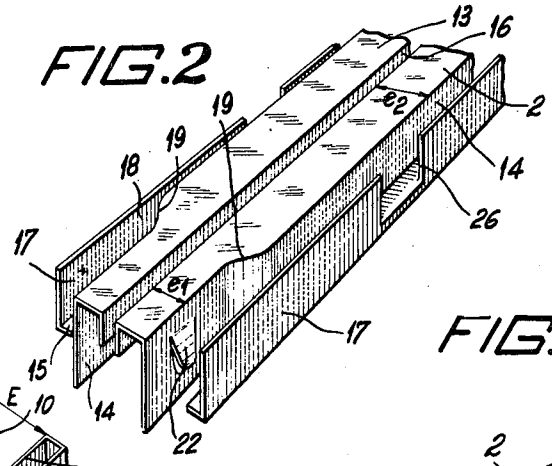


FIG. 1

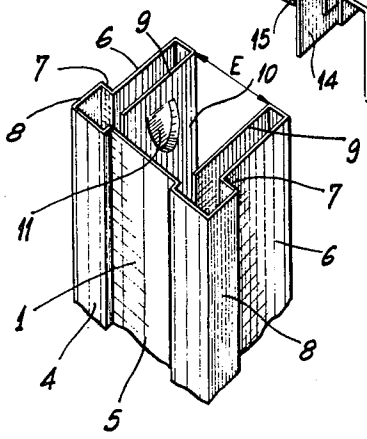


FIG. 4

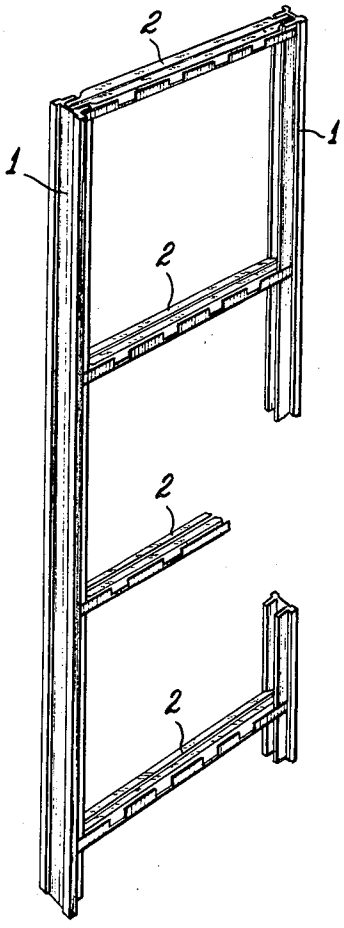
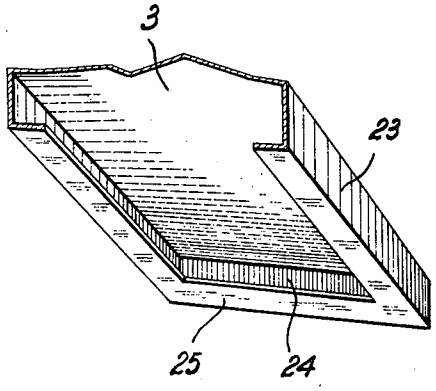


FIG. 3



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FIG. 5

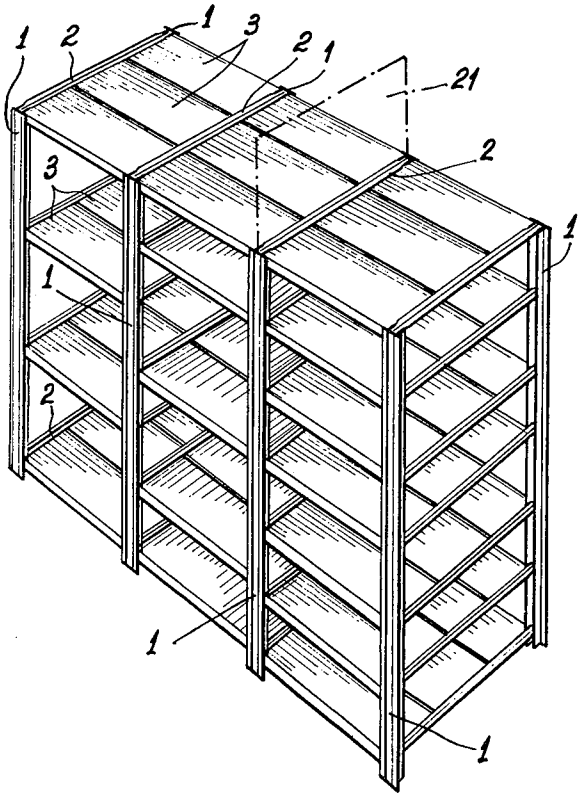
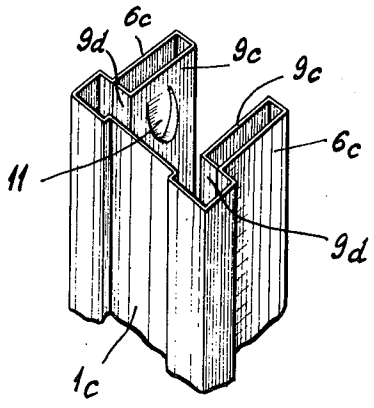


FIG. 11



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FIG. 6

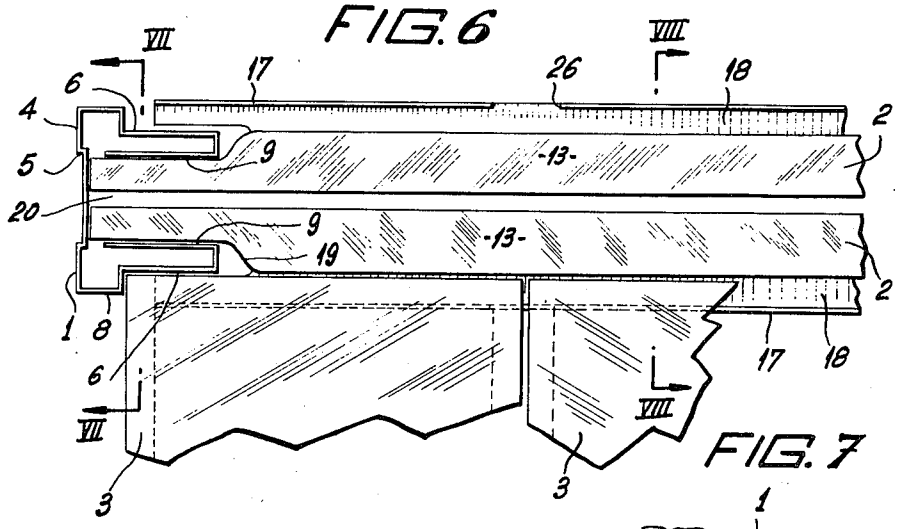


FIG. 7

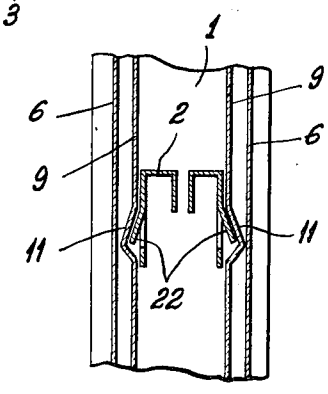
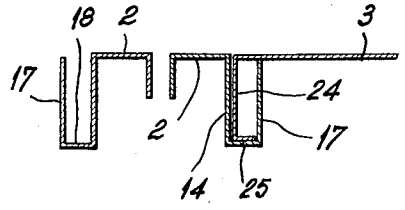


FIG. 8



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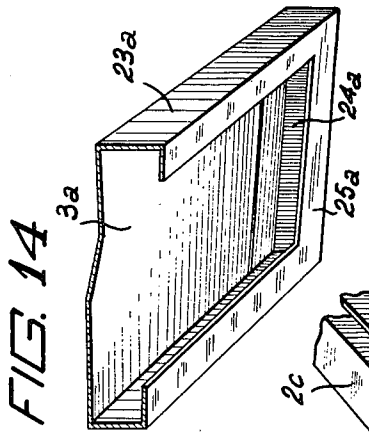


FIG. 14

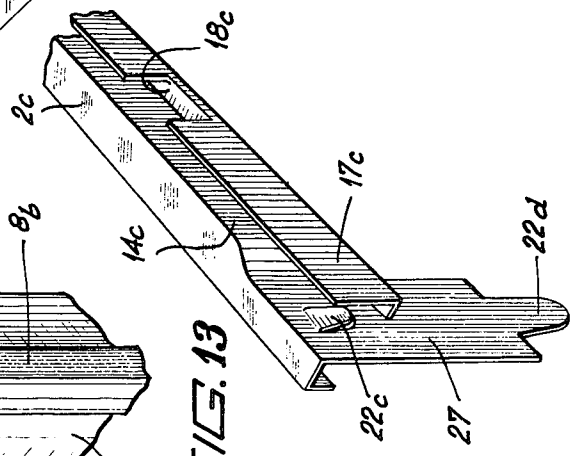


FIG. 13

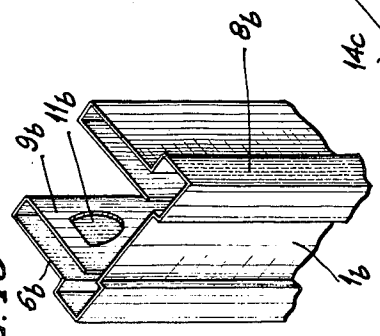


FIG. 10

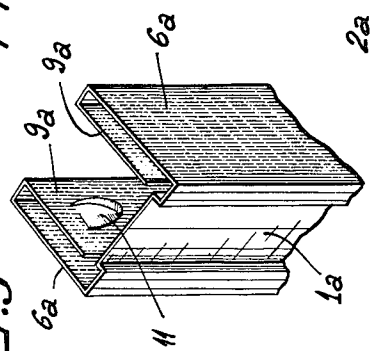


FIG. 9

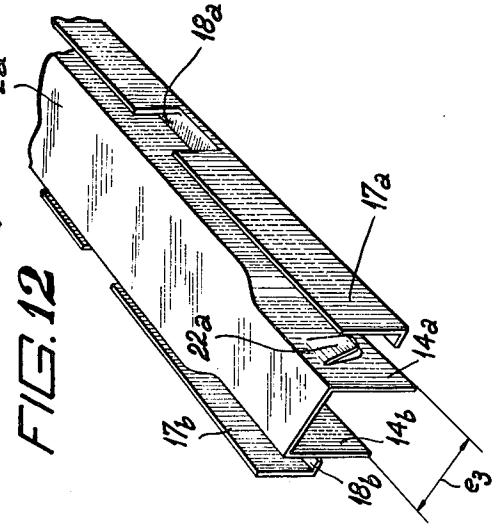


FIG. 12

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3,199,471

COLLAPSIBLE SHELVINGS

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Claims priority, application Italy, Apr. 30, 1963, 9,102/63
5 Claims. (Cl. 108—114)

This invention relates to collapsible shelvings of the type adapted to permit the construction of convertible shelves for stowing various articles.

Many designs of collapsible shelvings of this general character are already known. They comprise as a rule vertical uprights or posts adapted to be disposed by pairs, one at the front and the other at the back of the shelf structure, and trays or plates adapted to be supported horizontally between two successive pairs of vertical uprights to constitute superposed shelves. Various means for securing the horizontal trays or plates on the uprights have already been contemplated. Thus, in certain shelvings of this type detachable hook means are contemplated and adapted to engage orifices formed to this end in the uprights, these hooks subsequently receiving the horizontal trays or plates so as to safely hold same in position.

However, the use of complementary fastening means independent of the main component elements of the shelf structure is objectionable in that it is a source of complication when assembling the structure. On the other hand, these fastening means and their retaining orifices or other projections formed in the uprights for mounting these fastening means remain generally visible in the assembled condition. Now this is obviously detrimental as far as the proper and clean appearance of the shelvings consisting of elements of this type is concerned.

Finally, no horizontal bracing members or distance-pieces are provided between the two uprights of a same pair, these uprights being braced as a rule only subsequent to the fastening of the horizontal trays or plates. In most cases the rigidity of the assembly is far from satisfactory.

It is therefore the essential object of this invention to avoid the various drawback set forth hereinabove by providing a collapsible shelving structure wherein the component elements are adapted to be assembled without resorting to any separate fastening members, the means for securing the elements to one another being completely concealed upon completion of the mounting operation. It is a complementary object of this invention to permit the construction of shelves each providing a continuous or unbroken horizontal surface.

To this end, it is the primary object of this invention to provide a collapsible shelving consisting of the combination of vertical uprights adapted to be disposed by pairs, one at the front and the other at the back, of horizontal bracing members adapted to be disposed transversely between two uprights of a same pair, and of horizontal trays or plates adapted to constitute the shelves proper, characterized in that each upright consists of a section of substantially U-shaped cross-sectional configuration, wherein the inner channel is adapted to receive the corresponding end of said horizontal bracing members, and that the side arms of said section are formed with projections adapted to co-act with complementary projections formed on the ends of said horizontal bracing members, whereby said bracing members are suspended from said uprights inside the channel thereof, said horizontal trays being furthermore adapted to have their outer edges supported by two successive bracing members.

Preferably, according to a complementary feature of the shelving of this invention, the lateral arms of the section constituting each vertical upright are bent inwards twice to constitute a pair of parallel inner flanges bounding the aforesaid inner channel of the section, the projections adapted to co-act with the projections formed on the end portions of said horizontal bracing members being formed on said inner flanges.

Other features and advantages of the collapsible shelving according to the present invention will appear as the following description proceeds with reference to the accompanying drawings illustrating diagrammatically by way of example typical forms of embodiment of the invention. In the drawings:

FIGURE 1 is a fragmentary perspective view showing an upright of the shelving structure of this invention;

FIGURE 2 is a fragmentary perspective view illustrating two horizontal bracing members of this shelving structure, which are adapted to be secured side by side in an upright;

FIGURE 3 is a fragmentary perspective view from beneath of a tray or plate of the shelving according to this invention;

FIGURE 4 is a perspective view showing a transverse frame of the shelving which consists of the assembly of two vertical uprights with a series of horizontal bracing members;

FIGURE 5 is a perspective view illustrating a typical form of embodiment of a shelving structure according to this invention;

FIGURE 6 is a plane view from above of one portion of the shelving structure shown on a different scale;

FIGURES 7 and 8 are vertical sections taken respectively upon the lines VII—VII and VIII—VIII of FIGURE 6;

FIGURES 9, 10 and 11 are fragmentary perspective views illustrating various alternate forms of embodiment of the vertical uprights;

FIGURES 12 and 13 are fragmentary perspective views showing various alternate forms of embodiment of the horizontal bracing members; and

FIGURE 14 is a perspective view from beneath showing a modified form of embodiment of the horizontal trays.

As already explained hereinabove the shelving structure illustrated comprises in combination vertical uprights 1, horizontal bracing members 2 and trays 3 adapted to constitute shelves.

Each vertical upright 1 consists of a metal section having a substantially U-shaped cross-section. The intermediate portion of this section has a groove 5 formed on its outer face 4 to increase the rigidity and improve the appearance of the element while making less visible any surface flaws or defects.

The lateral arms 6 of the section are bent twice, as shown, so as to be offset inwards. Thus they comprise each a first in-turned portion 7 whereby the section comprises two external ribs 8 along the corners of its intermediate portion 5. Thus, as a whole the cross-sectional configuration of this section is more like the Greek letter π than like a U.

The two side arms 6 of this section are folded inwards on themselves so as to provide two parallel lips or flanges 9. These lips or flanges from therebetween the inner channel 10 of the section which has a width E.

On the inner face of the two inner lips or flanges 9 a series of punched or pressed recesses 11 are formed. These recesses 11 are spaced along a common vertical axis throughout the length of the upright and disposed by registering pairs on the two registering lips or flanges 9.

Due to its specific cross-sectional shape, the upright 1 has a considerable inertia and therefore a great rigidity. This section may be obtained by bending a metal strip by means of a suitable folding press or like machine of well-known design.

The horizontal bracing members 2 consist likewise of bent metal strips. The cross-sectional contour of this element is substantially S-shaped and comprises to this end a horizontal upper face 13, a vertical face 14 and a horizontal lower face 15. The upper face 13 comprises a down-turned flange 16 and the lower face 15 is formed on the olther hand with an up-turned flange 17 disposed vertically and registering with the face 14. Thus, a channel 18 is formed between this flange 17 and said face 14.

In the vicinity of each end of this section the vertical faces 14 are formed with a constricted or inwardly bent portion 19 so that the width e_1 of the upper face 13 of its end is smaller than the normal width e_2 of this face. In this respect it may be noted that the width e_1 is slightly inferior to half the width E of the channel 10 in the section constituting the vertical uprights.

Under these conditions, two sections 2 acting as horizontal bracing members may be disposed side by side in the channel 10 of an upright. Thus, a slight play 20 remains which may be used for fitting a vertical partition wall 21 (see FIGURE 5). The lower edge of this partition wall 21 is then fitted into this play 20 and retained by means of lugs formed integrally therewith which engage the upper face 13 of the two horizontal bracing members 2 disposed side by side.

Each bracing member incorporates in its end portion a mounting hook consisting of an ear 22 punched or pressed in the vertical face 14 of the section. This hook projecting from the face 14 registering with the up-turned flange 17 is adapted to fit into one of the punched or pressed recesses 11 formed on the inner face of the inner flanges 9 of the vertical uprights.

To secure the end of a horizontal bracing member on a vertical upright the former is engaged into the channel 10 of the latter while causing its vertical face 14 to contact one of the inner flanges 9 of the upright, so that its mounting hook 22 will engage the corresponding recess 11 disposed at the desired level for securing this bracing member. Thus the bracing member is safely fastened on the upright. Its end portion is completely concealed within the upright together with the fastening means provided to this end. In fact, the hooks 22 and recesses 11 are not visible from the outside.

It may also be noted that the end edge of the bracing member engages with a certain pressure the inner face of the groove 5 of the upright in the assembled condition. This feature prevents the bracing member from turning in relation to the upright.

It may further be noted that the width e_2 of the upper face 13 of the bracing member is such that the vertical face 14 thereof is then aligned with the corresponding lateral arm 6 of the vertical upright (see FIGURE 6). As already explained, two horizontal bracing members 2 may thus be secured side by side at the same level in the channel 10 of a vertical upright. Of course, these two bracing members 2 should be disposed oppositely as illustrated in FIGURES 2 and 6. Their fastening hooks 22 engage a pair of registering recesses 11 located at a same level in the inner flanges 9 of the section.

The side channels 18 of these bracing members are thus adapted to receive therein the corresponding end portions of the trays or shelves 3. Each tray consists as shown in FIGURE 3 of a substantially rectangular plate having its long and short marginal portions 23 and 24 folded downwards and bent inwards; the inwardly bent portion 25 of the shorter edges 24 is secured for example by welding on the marginal portions 23 so that a complete frame structure underlying the plate 3 is obtained.

The width of the parallel channels 18 of each horizontal bracing member corresponds substantially to that of the folded edges 23 at the end of each tray 3. Therefore, the ends of these trays may fit into said channels and be safely held therein.

Thus, several trays 3 may be disposed in succession by engaging their shorter ends into the channel 18 of a same

horizontal bracing member 2, according to the width contemplated for the shelf or shelving structure. The upturned edge 17 of each horizontal bracing member is formed to this end with a plurality of properly spaced notches 26 adapted to receive the longitudinal folded edges 23 of two trays 3 disposed side by side. Under these conditions, the trays are prevented from moving in their transverse direction along the relevant bracing members 2. On the other hand, it may be noted that the tray 3 nearest to the vertical upright 1 engages the outer rib 8 on the corresponding side of this upright, thus preventing any undesired forward movement of this tray.

A shelving structure, for example of the type illustrated in FIGURE 5, may be erected by using the three types of shelf component elements of this invention by firstly preparing a series of vertical frames arranged as shown in FIGURE 4. Each frame consists of a pair of vertical uprights 1 disposed one at the front and the other at the back, and of a series of horizontal bracing members 2 secured between these front and back uprights at different levels, according to the desired vertical spacing of the trays. As already stated, two bracing members 2 may be secured side by side between the two uprights at a same level. The various frames thus constructed are disposed vertically and in parallel relationship to constitute the framework on which the shelf forming trays 3 are subsequently disposed. These trays 3 are secured as already explained by engaging their short ends into the channels 18 formed along the horizontal bracing members 2. Thus, a shelving structure of moderate or considerable height may be constructed without difficulty by using the proper number of component elements. The shelving thus obtained is particularly sturdy due to the reliable fastening of the component elements to one another. Then the horizontal bracing members have a dual function. In fact, they are firstly integral component elements of the vertical frames constituting the transverse frameworks of the structure, and secondly they act as supporting and hooking members to the horizontal trays. Due to the specific configuration of their cross-section these bracing members have a considerable yield strength, this feature being particularly important since these bracing members constitute the transverse supports of the horizontal trays or plates.

The shelving structure obtained in the manner described hereinabove is characterized by a particularly neat and pleasant appearance since the ends of the horizontal bracing members are concealed within the vertical uprights, the same remark also applying to the recesses formed inside the uprights. On the other hand, the upper face of trays 3 is flush with the upper face 13 of the horizontal bracing members and thus substantially no gap is left between the trays and the bracing members, due to the variation in width of these bracing members, of which the vertical face 14 is thus aligned with the lateral arms 6 of the relevant vertical uprights. Moreover, the play 20 provided between two horizontal bracing members disposed side by side may be used for mounting vertical partition walls or plates 21.

The shelving structure according to this invention can be disassembled very easily, without resorting to tools for unscrewing bolts or loosening other fastening members, as contrasted with most hitherto known collapsible shelving structures.

If desired, the depth of a shelving structure may be modified by substituting horizontal bracing members of same type but of different length for those contemplated initially. Thus, by varying the length of these bracing members a variable number of horizontal trays may be provided. On the other hand, since these trays are held against transverse movement by the provision of notches 26 in the bracing members 2 it is possible, if desired, to mount one tray at the front and another tray at the rear and to leave a free gap therebetween. These trays are particularly strong due to their inherent structure and nota-

bly the provision of folded marginal portions constituting a reinforcing frame.

It is clear that the collapsible shelving of this invention should not be constructed as being limited by the specific forms of embodiment hitherto described, illustrated or suggested herein, since various modifications may be brought to the various component elements thereof.

Thus, FIGURES 9, 10 and 11 of the drawings illustrate three alternate forms of embodiment of the vertical uprights. In the example shown in FIGURE 9 the vertical upright 1*a* differs from the upright 1 of FIGURE 1 only by the fact that the outer ribs 8 are dispensed with. In other words, the section constituting this upright has actually the general configuration of a U in lieu of a π, its side arms 6*a* being bent twice to provide a pair of inner flanges 9*a* forming the inner channel of the upright. Of course, these inner flanges 9*a* are also formed, as in the preceding case, with a series of spaced recesses 11 for receiving the corresponding projetcions formed on the horizontal bracing members.

The upright 1*b* of FIGURE 10 differs from the upright 1 of FIGURE 1 only in that the recesses 11 are replaced with perforations 11*b* formed in the inner flanges 9*b* of the side arms 6*b* of the upright section. In this case, these perforations 11*b* are used for inserting the fastening hooks 22 of the horizontal bracing members therein.

Finally, the upright 1*c* illustrated in FIGURE 11 departs from the design shown in FIGURE 1 in that the inner flanges 9*c* of its lateral arms 6*c* are formed with folded marginal portions bearing against the inner face of the lateral arms. This modified shape obviously increases greatly the rigidity of the upright on both sides.

Many modifications may also be brought to the horizontal bracing members 2 without departing from the basic principles of this invention. Thus, FIGURES 12 and 13 illustrate two alternate forms of embodiment of these bracing members.

The bracing member 2*a* of FIGURE 12 is adapted to be substituted for the pair of horizontal bracing members 2 disposed side by side and at the same level between two vertical uprights. In fact, this modified bracing member has an inverted-U configuration in cross-section and its two vertical faces 14*a* and 14*b* comprise upturned lips 17*a* and 17*b* respectively to provide a pair of channels 18*a*, 18*b* on either side of the central portion. These channels are adapted to receive the shorter marginal portions of trays 3 disposed in succession on a same level.

The width 3*e* of the end portions of each bracing member 2*a* corresponds substantially to the width E of the channel 10 of certical uprights 1. Of course, the ends of this bracing member 2*a* are formed with a mounting hook 22*a* on each vertical face 14*a*, 14*b*. These hooks may thus engage the registering recesses 11 or perforations 11*b* formed at a same level in the two inner flanges of the vertical uprights.

The horizontal bracing member 2*c* illustrated in FIGURE 13 differs from the bracing member 2 of FIGURE 2 only in that it is formed at either end with an integral depending lug 27 comprising in turn another integral fastening hook 22*d* underlying the first fastening hook 22*c*. The relative spacing of these two hooks 22*c*, 22*d* corresponds substantially to that of the recesses 11 formed in the inner flanges 9 of the vertical uprights. Thus, this horizontal bracing member 2*c* may engage simultaneously two recesses or perforations formed in the inner flanges of the vertical uprights.

The horizontal trays may also have various forms of embodiment. Thus, FIGURE 14 illustrates a modified design thereof wherein the tray 3*a* carries separate end portions 24*a* and 25*a* welded at 28 on the main body of the tray, instead of consisting of cut and folded portions. The longitudinal edges 23*c* of this tray may be provided with folded portions or with separate strips welded thereon.

Finally, the sections constituting the vertical uprights as well as the horizontal bracing members may be manufactured according to any adequate and known method and from any suitable material. Besides in certain cases and for certain applications these sections may be produced by extrusion through a die instead of by folding sheet-metal stock.

What I claim is:

1. A collapsible shelving comprising in combination a plurality of vertical uprights adapted to be disposed by pairs, one at the front and another at the back of the shelving, each upright consisting of a section of substantially U-shaped cross-sectional configuration and having therefore two side arms and an intermediate portion adapted to be disposed on the exterior of the shelving; a series of horizontal bracing members adapted to be disposed transversely between two uprights of a same pair, the end portions of said bracing members being adapted to be engaged in the channel of said vertical uprights; hooking projections formed on the end portions of said horizontal bracing members; the side arms of the respective section constituting each vertical upright being bent inwards on themselves to provide a pair of parallel flanges bounding the inner channel of the respective section, said flanges being formed with respective recesses complementary to said hooking projections formed on said end portions of said horizontal bracing members and adapted to receive said hooking projections whereby said bracing members may bear upon said uprights; a series of trays adapted to constitute shelves, complementary hooking means formed on said horizontal bracing members and on the ends of said trays to permit the horizontal mounting of said trays by engaging the tray ends on said bracing members.

2. A collapsible shelving as set forth in claim 1, wherein the hooking projections formed on the end portions of said horizontal bracing members are in the form of depending lugs and the complementary recesses formed on the inner flanges of the lateral flanges of the sections constituting said vertical uprights are notches adapted to receive said depending lugs.

3. A collapsible shelving as set forth in claim 1, wherein the width of the ends of said bracing members is about half that of the inner channel of said vertical uprights, whereby the end portions of two horizontal bracing members are adapted to be disposed side by side at a same level into the channel of a vertical upright, said hooking projections provided on the end of each bracing member being formed on the vertical face thereof which is adapted to engage the corresponding inner flange of a vertical upright for engagement with the complementary recesses formed in said flange.

4. A collapsible shelving as set forth in claim 1, wherein the width of the end portions of said horizontal bracing members is less than half the width of said inner channel formed in said vertical uprights, whereby the end portions of said two horizontal bracing members may be disposed side by side at a same level in the channel of a vertical upright, and that in this case a certain play remains between said two bracing members, the hooking projections provided on the end portion of each bracing member being formed on the vertical face thereof which is intended to bear against the corresponding inner flange of a vertical upright so as to engage complementary recesses formed on said flange, said shelving further comprising a series of plates each adapted to be disposed vertically in the gap left by said play between two horizontal bracing members disposed side by side, whereby each one of said plates may constitute a partition wall in the shelving.

5. A collapsible shelving as set forth in claim 1, wherein the width of the end portions of said horizontal bracing members is substantially equal to that of said inner chan-

nels of said vertical uprights, said hooking projections of said end portions being formed on both vertical faces and adapted to engage the complementary recesses formed in the two inner flanges of said vertical uprights.

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FRANK B. SHERRY, *Primary Examiner.*