Feb. 24, 1942. C. R. CARNEY 2,274,125

REFRIGERATOR SHELF

Filed April 25, 1940 2 Sheets-Sheet 1

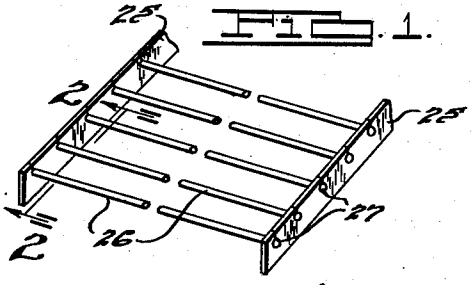


FIG. 1.

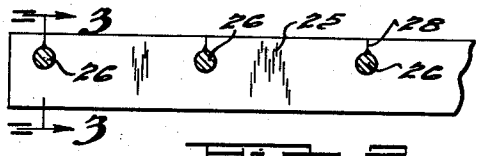


FIG. 2.

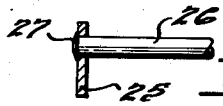


FIG. 3.

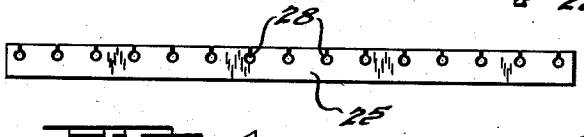


FIG. 4.

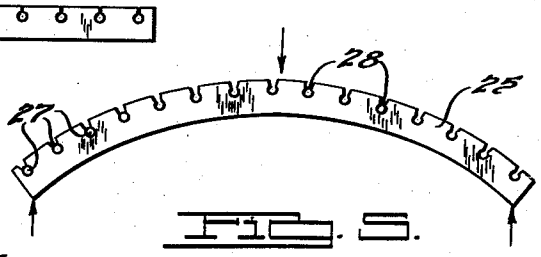


FIG. 5.

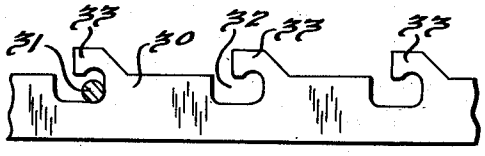


FIG. 6.

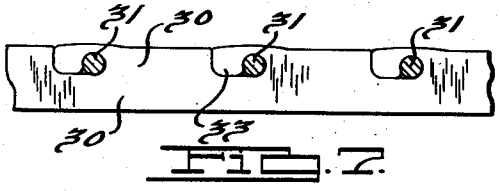


FIG. 7.

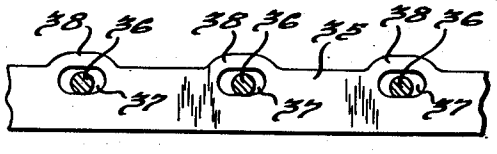


FIG. 8.

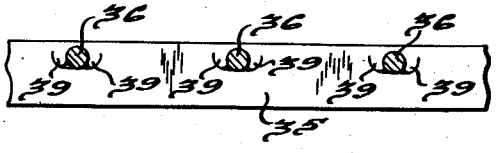


FIG. 9.

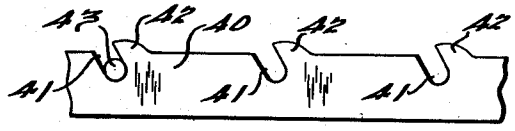


FIG. 10.

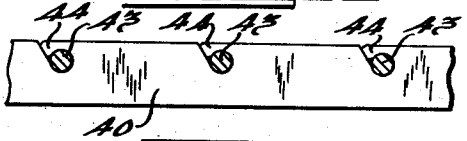


FIG. 11.

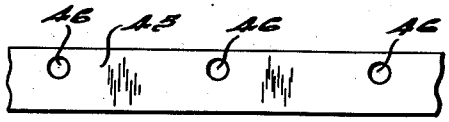


FIG. 12.

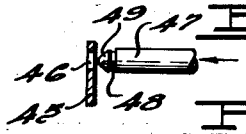


FIG. 13.

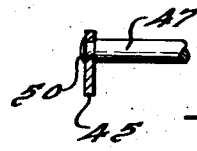


FIG. 14.

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REFRIGERATOR SHELF

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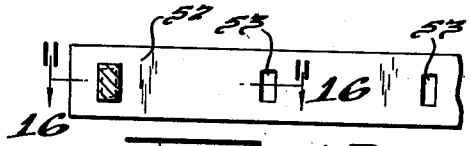


FIG. 15.

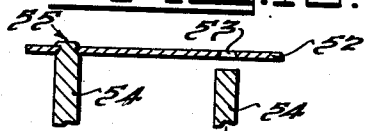


FIG. 16.

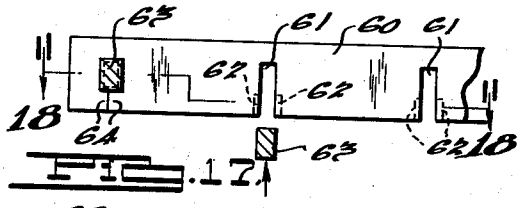


FIG. 17.

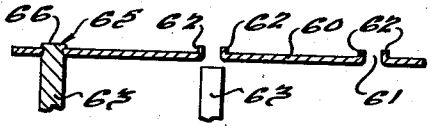


FIG. 18.

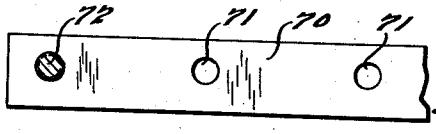


FIG. 19.

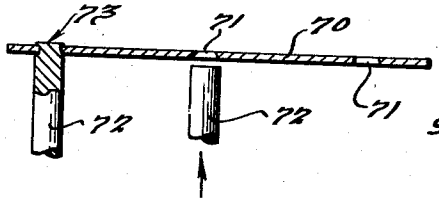


FIG. 20.

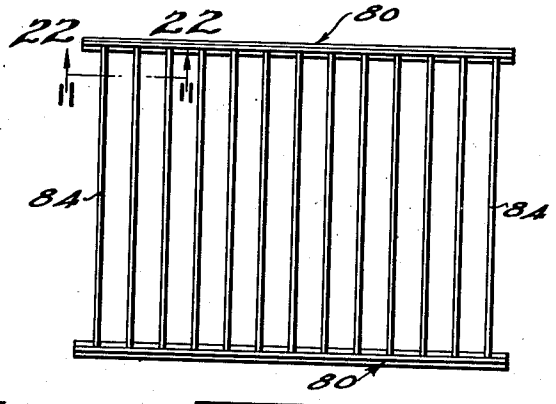


FIG. 21.

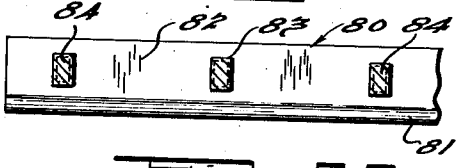


FIG. 22.

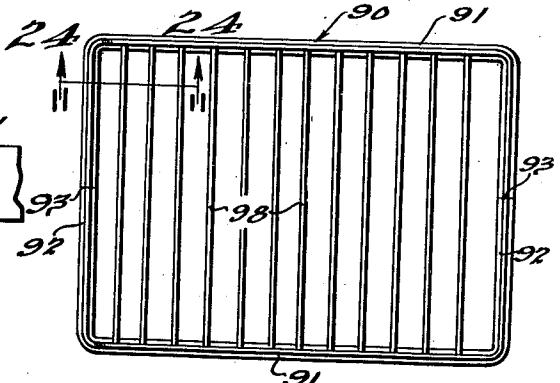


FIG. 23.

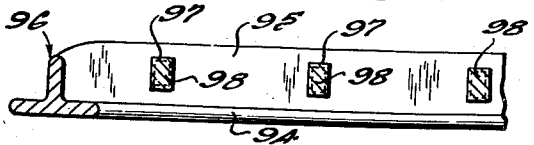


FIG. 24.

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UNITED STATES PATENT OFFICE

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REFRIGERATOR SHELF

Clifford R. Carney, Detroit, Mich.

Application April 25, 1940, Serial No. 331,497

1 Claim. (Cl. 211—153)

This invention relates to refrigerator shelves and the like and to a method of producing the same.

One of the objects of the present invention is to provide an improved refrigerator shelf or the like in which the cross members and the side members or rails are united without welding to form an integral or unitary whole, thus permitting the manufacture of such shelves from materials such as aluminum, stainless steel or other materials which are difficult to weld.

Another object of the invention is to provide an improved refrigerator shelf comprising side or end members or rails formed from a relatively hard metal and cross members formed from a relatively softer metal, the latter members being mechanically united at or adjacent their opposite end portions to the side or end members or rails to produce a unitary shelf, and in which the side members or rails and cross members may be formed of the same or different materials.

Another object of the present invention is to provide a refrigerator shelf having supporting rails or members formed from a relatively hard metal such, for example, as steel, stainless steel or the like, and a plurality of cross members interconnecting the rails and formed of flat relatively narrow strips of anodized aluminum or from aluminum wire, the rails and the strips, or wire being preferably mechanically united together.

A further object of the invention is to provide a shelf of the foregoing character in which the side members or supporting rails determine and constitute the thickness of the shelf.

Another object of the invention is to provide an improved shelf which, by reason of the use of side members or rails formed from a relatively hard metal with cross members formed from a relatively softer metal, permits the metal of said side members to bite into the metal of the cross members when the parts are mechanically united together.

Another object of the invention is to provide an improved shelf in which the use of metals having different characteristics and different degrees of hardness provides a shelf of attractive appearance due to the inherent differences in color of the different metals.

A further object of the invention is to provide a shelf of the foregoing character which is of relatively light weight, which possesses the characteristics of strength and durability, and one which is relatively simple and inexpensive to manufacture.

Another object of the invention is to provide an improved method or process for producing shelves of the foregoing character by virtue of a relatively simple and inexpensive series of steps.

The above and other objects and advantages of the invention will appear from the following description and appended claim when considered in connection with the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

Fig. 1 is a fragmentary perspective view of a shelf embodying the present invention.

Fig. 2 is an enlarged fragmentary sectional view taken substantially along the line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a fragmentary sectional view taken substantially along the line 3—3 of Fig. 2, looking in the direction of the arrows.

Figs. 4 and 5 illustrate two of the steps of the method employed in producing the shelf of the foregoing figures.

Figs. 6 and 7 illustrate two steps of the method of producing a shelf of somewhat modified form embodying the present invention.

Figs. 8 and 9 represent two steps of a method for producing a further modified form of shelf embodying the present invention.

Figs. 10 and 11 illustrate two steps of a method for producing a further modification embodying the present invention.

Figs. 12, 13 and 14 illustrate steps in a method for producing an improved shelf of a still further modified construction embodying the present invention.

Fig. 15 shows another modified form of the invention and illustrates one step of a method for producing an improved shelf embodying the present invention.

Fig. 16 is a fragmentary sectional view taken substantially along the line 16—16 of Fig. 15, looking in the direction of the arrows and illustrating one of the steps of the method for producing the shelf shown in Fig. 15.

Fig. 17 is a further modification of the present invention and illustrates one step in the method of producing a shelf in accordance with said modification.

Fig. 18 is a sectional view taken substantially along the line 18—18 of Fig. 17, looking in the direction of the arrows.

Fig. 19 is a fragmentary edge view or side ele-

vation of a further modified form of shelf embodying the present invention.

Fig. 20 is a horizontal sectional view, partly in elevation, of the shelf of Fig. 19, illustrating one of the steps of the method employed to produce said shelf.

Fig. 21 is a bottom plan view of a shelf embodying a further modification of the present invention.

Fig. 22 is an enlarged fragmentary sectional view taken substantially along the line 22—22 of Fig. 21, looking in the direction of the arrows.

Fig. 23 is a bottom plan view of an improved shelf embodying a further modified form of the present invention; and

Fig. 24 is an enlarged fragmentary sectional view, taken substantially along the line 24—24 of Fig. 23, looking in the direction of the arrows.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring now particularly to Figs. 1 to 5 inclusive of the drawings, the refrigerator shelf of the present embodiment of the invention comprises, as shown, side or end members or supporting rails 25 which may be formed from relatively hard metal such, for example, as steel, stainless steel, or the like. The members 25, as shown, are disposed in spaced substantially parallel relation and are preferably interconnected by means of a plurality of cross members, bars or the like 26 which may be formed from a relatively softer metal, such for example as aluminum. These cross members 26 may be of varying cross sectional shapes and, as shown, are substantially equidistantly spaced and have their opposite end portions 27 located within notches or openings 28 formed in the side members 25. It will be understood that the number of cross members employed to produce the shelf is dependent upon the size of the shelf and the desired spacing of said members. These cross members have their end portions 27 mechanically united to the members or rails 25. This mechanical uniting of the parts may be performed in any suitable and convenient manner, such as by placing the parts in a press and subjecting them to pressures of sufficient magnitude to compress the metal and effect a tight union or uniting of the parts. By virtue of the fact that the metal of the side members or rails 25 is relatively harder than that from which the cross members 26 are formed, the metal of said side members will bite into the cross members to provide, in effect, a resultant integral or unitary structure. If desired, the ends 27 of the cross members may be peened, as best seen in Fig. 3.

The shelf of Figs. 1 to 5 inclusive may be formed, merely by way of illustration, in the following manner:

A relatively thin and relatively narrow strip or pair of strips 25 are provided with the notches or openings 28 which may be stamped therein, being located in longitudinally spaced relation at or adjacent one longitudinal edge of the strip or side member. Thereafter, as seen in Fig. 5, the notched strip may be bowed or arched to open the previously formed slots, openings or notches. The end portions 27 of the spaced cross members are then inserted in the notches or openings 28, whereupon the assembled parts are placed in a press and subjected to pressure to effect a mechanical uniting or union of the members 25 and the cross pieces 26. As stated above, pressures of sufficient magnitude are applied to the longitudinal edges of the members 25 to cause the metal adjacent the notches 28 to grip and bite into the metal of the cross members at the end portions 27 thereof. The exposed ends of the members 26 may then be peened or rounded over to present a smooth surface at the outer face of each of the side or rail members 25. If it is desired to have the cross members 26 located further away from the notched longitudinal edge of the rail 25, it is merely necessary to provide deeper notches or openings in lieu of those shown at 28.

Another form of shelf embodying the present invention and one method of producing it are illustrated in Figs. 6 and 7. As in the previous form, a pair of side members 30 similar to the members 25 serves to support a plurality of cross members 31. The side members 30 are preferably formed from relatively hard metal, such as steel or stainless steel, and the cross members are preferably formed from a relatively softer metal, such as aluminum or aluminum alloy, or the like. As shown, one longitudinal edge of each of the side members 31 is provided with a plurality of longitudinaliy spaced slots or recesses 32 which may be in the form of J-slots. These slots are formed in any suitable manner and the metal removed during their formation extends outwardly beyond the edge of the member to provide a plurality of overhanging portions 33. The cross members or bars 31 have their end portions positioned in the slots in the opposed side members after which pressure is applied to said members or rails to compress the metal thereof to cause the overhanging portions 33 to be pressed or forced into the slots 32 to firmly grip the end portions of the cross members or bars 31. Since the metal forming the end members or rails is relatively harder than that from which the cross members are formed, a tight union is made between the parts and the harder metal bites into the surfaces of the cross bars or rods to form a unitary shelf structure.

A further modified form of the present invention is shown in Figs. 8 and 9. In these figures the side members or rails 35 are formed from a relatively hard metal, with the cross bars or members 36 being preferably formed from a relatively softer metal. The side rails 35 as shown, are provided with a plurality of longitudinally spaced slots or openings 37 which may be produced in any suitable and convenient manner to provide a plurality of outward projections or bridge pieces, such as those shown at 38, each of the bridge pieces being disposed over an opening 37. The opposite end portions of the cross members or rods 36 are inserted in the openings 37 and pressure is applied to the side rails to force the bridge pieces or portions 38 to enter the opening and grip opposite sides of the cross members as shown at 39, Fig. 9. The metal of the side rails will bite into the end portions of the cross members 36 and provide a tight union between the parts. As in the preceding views, the assembled side rails and the cross members may be placed in a press and subjected to pressures of sufficient magnitude to effect the mechanical union of the parts above referred to.

In Figs. 10 and 11 a further modified form of shelf embodying the present invention is shown. In this form the side members or rails **40** are preferably formed from relatively hard metal stock, such as steel or stainless steel, and are provided in one longitudinal edge with a series or plurality of longitudinally spaced angular open slots or recesses **41**. These slots may be formed in any desirable manner and when so formed provide an upstanding portion or mass of metal **42** adjacent each of the slots. The shelf of this form of the invention includes a plurality of cross members or bars **43**, the opposite end portions of which are positioned within opposed slots **41**. Pressure is then applied to the side members **40** to force or press the metal portions or projections **42** into the slots or openings **41** until they assume the positions as shown at **44** in Fig. 11. Such action will cause the metal of the side rails to bite into the adjacent surfaces of the end portions of the cross members or rods **43** to lock the rods in place and thus provide a unitary shelf structure.

A further modified form of the present invention is shown in Figs. 12 to 14 inclusive. In this form a pair of spaced side members or supporting rails **45** is provided. Each of the rails has formed therein intermediate its opposite longitudinal edges a plurality or series of preferably round holes or openings **46** which are provided for the purpose of receiving the end portions **48** of cross members or rods **47**. The side members or rails are preferably formed from steel or stainless steel and the cross members or rods from a relatively softer metal such as aluminum, aluminum alloy, or the like. As best seen in Fig. 13, the opposite end portions **48** of each of the cross members or rods have preferably frusto-conical heads or portions **49** which, as shown, are separated by a reduced shank portion from the main body or portion of the rod. The heads **49** at opposite ends of the rods or wires **47** may be of slightly greater diameter than the diameter of the holes or openings **46**. To assemble the cross rods with the end members, pressure is preferably applied to the rods in a longitudinal direction to force the heads or end portions thereof to enter the openings **46**. After thus assembling the rods and side members it may be desirable to insert the parts in a press and apply pressures of sufficient magnitude to the longitudinal edges of the side rails to effect a tight mechanical union of the parts. This last named step may, however, be eliminated since pressure applied in a longitudinal direction to the rods will suffice to effect a tight union. The opposed head portions **49** may, if desired, be peened to present a smooth finish or surface at each end of the rod, as shown at **50**, Fig. 14.

Referring now to Figs. 15 and 16 there is shown another modified form embodying the present invention. In this form a pair of side members or rails **52** preferably formed from a relatively hard metal, has a series of longitudinally spaced substantially rectangular openings **53** formed therein intermediate the opposite longitudinal edges of each member. As in the preceding forms, the side members are adapted to receive and support the end portions of a plurality of longitudinally spaced cross members or bars. In the present form these cross members are shown at **54** as being substantially rectangular in cross section and are preferably formed from some relatively softer metal than the side members, such for example as anodized aluminum, or the like.

As seen in Fig. 16, the holes or openings **53** are preferably tapered and the cross members or bars have a diameter which is slightly greater than the greatest diameter of the openings **53**. The parts are preferably assembled by subjecting the cross members **54** to pressures longitudinally thereof as indicated by the arrow in Fig. 16, to force the end portions thereof into the holes or openings **53** to produce a tight union of the parts as shown at **55** in this figure. As in certain of the preceding forms and after assembly of the parts the exposed ends of the cross members **54** may be peened to provide a smooth surface. It will be understood also that since the metal of the side members **52** is relatively harder than that from which the cross members **54** are formed, the metal of the side members surrounding the end portions of the cross members will bite into the cross members to secure the parts together as a unit.

Referring now particularly to Figs. 17 and 18, a further modified form is shown. The shelf of the present form is composed of side members or supporting rails **60** formed from a relatively hard metal, such as steel or stainless steel. Each side member is provided with a transverse slot or opening **61** which extends inwardly from one longitudinal edge of the side member to a point beyond the longitudinal center thereof. The metal at opposite sides of each of the slots adjacent the open end thereof is pressed outwardly to provide a pair of angularly disposed ears or flanges **62**.

The slots **61** are adapted to receive and support the opposite end portions of cross members or bars **63**. These bars are of slightly greater cross section than the slots **61** and are preferably formed from a metal which is relatively softer than the cross members or rails **60**, such as from aluminum, or the like.

The cross members **63** may be assembled with the side rails **60** in any suitable manner. As shown, the end portions of the cross members **63** are inserted between the ears or flanges **62** formed from the side members and pressure is then applied, as indicated by the arrow in Fig. 17, to force the end portions of the cross members into the slots **61**. Thereafter the ears or flanges **62** are subjected to pressure or a force sufficient to return them to their original position, as best seen at **64** in Fig. 17. By forcing the end portions of the cross members **63** into the slots, the metal of the side rails adjacent said slots will be caused to bite into the adjacent surfaces of the cross members to provide a tight union of the parts. By flattening the ears **62** which underlie the adjacent edges of the cross members, an additional securing together or bonding of the parts is effected. The result of the method of assembling the cross members **63** with the rails **60** in accordance with the present form of the invention is clearly illustrated at **65** in Fig. 18. If desired, the exposed ends of the members **63** may be peened, as seen at **66**.

Referring now to Figs. 19 and 20 of the drawings, there is shown therein another modified form embodying the present invention. In this form of the invention a pair of side members or supporting rails **70** are provided with a series of preferably round holes or openings **71** located in longitudinally spaced relation. The rails are preferably formed from a relatively hard metal such as stainless steel or the like. The holes or

openings 71 are adapted to receive and support the end portions of cross members or rods 72 formed from a relatively softer metal, such as aluminum or the like. As seen in Fig. 20, the holes or openings 71 are slightly tapered. As shown, the diameter of the rods 72 is somewhat greater than the largest diameter of the holes 71. The cross members are assembled with the side members 70 by applying pressures longitudinally of the cross members of sufficient magnitude to force the end portions of said members into the openings 71 to provide a tight union or joint between the parts such as that shown at 73 in Fig. 20. By virtue of the fact that the side members or rails are formed from harder metal than the cross members, the metal of said side members surrounding the holes or openings 71 will firmly grip and bite into the adjacent surfaces of the cross members to lock the parts together. If desired, the exposed ends of the rods or wires 72 may be peened after their assembly with the side rails. The arrow in Fig. 20 indicates the direction of the application of pressure to the parts during the method of assembly.

In Figs. 21 and 22 a further modified form embodying the invention is illustrated. In this form of the invention side members or rails 80 are provided which, as shown, are of T-shaped cross section, each rail having a base portion 81 and a substantially centrally disposed upstanding web or flange 82. The flanges or webs 82 of the cross members are provided with a plurality of longitudinally spaced holes or openings 83 which are adapted to receive and support the opposite end portions of cross members or bars 84. The parts are assembled by inserting the end portions of the bars in opposed pairs of openings 83, after which the assembled parts are placed in a press or other apparatus and subjected to pressures of sufficient magnitude to cause a tight union between the parts. By subjecting the shelf to pressure, as mentioned, and by virtue of the fact that the side members are formed from a relatively harder metal than the cross members, the metal of said side members surrounding the openings 83 will be caused to bite into the adjacent surfaces of the end portions of the cross members 84 to firmly lock the parts together as a unit.

As in the preceding forms the end members 80 may be formed of steel, such as stainless steel or the like, and the cross members 84 from aluminum, aluminum alloy or the like.

Referring now to Figs. 23 and 24 of the drawings, there is shown a further modified form of the present invention. In this form the shelf is provided with a frame shown as a whole at 90, which frame has spaced opposed side portions 91 and spaced opposed end portions 92. As seen in Fig. 23 the frame may be formed from two substantially U-shaped sections with the abutting ends thereof being secured together at 93 in any suitable manner, as by butt welding. As shown in Fig. 24, the frame is preferably T-shaped in cross section having a base portion 94 and an intermediate upstanding web or flange portion 95. The shelf of the present form of the invention is adapted for use in a refrigerator or the like whose depth from front to back is greater than its width. If desired and to facilitate the easy removal of articles from the shelf, the front end 92 of the shelf, shown at the left of these figures, may be reduced in height as indicated at 96, Fig. 24.

The frame 90 is provided in the side portions 91 of its upstanding web or flange 95 with a plurality of longitudinally spaced and opposed substantially rectangular openings 97 which are adapted to receive and support the end portions of cross members or bars 98. One method of assembling the parts of the present form of the invention is to insert the end portions of the cross member 98 in the opposed openings 97 and to place the assembled parts into a press and subject them to pressures of sufficient magnitude to cause the relatively harder metal of the web or flange 95 at portions surrounding the cross members 98, to bite into the latter and securely lock the parts together to provide a unitary and, in effect, an integral structure.

While I have disclosed herein several methods for assembling shelves in accordance with the present invention, it is to be understood that the side members or supporting rails, as well as the supporting frame of Figs. 23 and 24, may be assembled with the cross members in any suitable and convenient manner or by any method capable of performing a mechanical uniting of the parts. In all forms of the invention it will be understood that by applying mechanical pressures to the parts the relatively harder metal of the supporting rails or supporting frame of the shelves will be caused to bite into the adjacent surfaces of the softer metal of the cross members, thus effecting a tight union between the parts.

It is also to be understood that a shelf embodying any of the foregoing disclosures may be formed of any suitable material and that the side rails or members may, if desired, be formed of materials of the same kind. In this event, the parts will be united when one or the other is deformed under pressure and they will be held in their assembled positions by a mechanical union of the parts.

By virtue of the present invention metal of lighter gauge may be employed in the manufacture of shelves in accordance with said invention, and moreover, because of the fact that a materially lesser quantity of metal is used to produce said shelves, it is possible to employ metals of higher grade having finished external surfaces, and thus produce superior and improved shelves at a manufacturing cost which is comparable to, or perhaps even lower than the cost of shelves heretofore made from lower grade unfinished metals.

The shelf when completed may be finished in any desired manner as by polishing, buffing, plating, etc.

I claim:

An article of manufacture comprising spaced substantially parallel retaining rails formed from a relatively hard metal, said rails each having a plurality of longitudinally extending equidistantly spaced openings formed therein, and a plurality of substantially equidistantly spaced cross members formed from a relatively softer metal having their opposite end portions located within said openings and mechanically united to said rails for interconnecting the rails, the initial diameter of said end portions being somewhat greater than that of said openings prior to the mechanical uniting of the parts.

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