United States Patent

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Continuation of application Ser. No. 705,163, Feb. 13, 1968, now abandoned.
[45] Patented **Feb. 2, 1971**

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[54] **WIRE CLOTH TRAY**
24 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **220/19,** 263/47
[51] **Int. Cl.** **B65d 7/20,** F27b 21/04
[50] **Field of Search** 220/19, 83; 263/47, 48, 49

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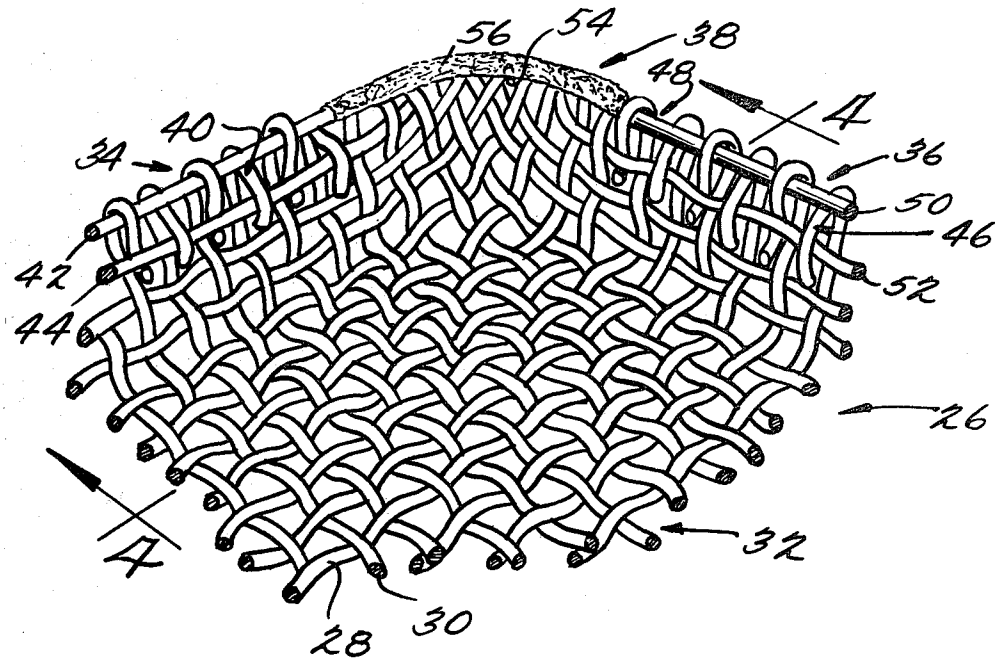
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ABSTRACT: A wire cloth tray in which the interwoven longitudinal and transverse wires are gathered at each corner to form a rounded corner, the sidewalls and endwalls being bent over at their upper extents to define their top edges and each rounded corner being severed across its upper extent and the severed edges being welded throughout its length to connect all of the severed wires of each corner. The invention also relates to a reinforcing bar which extends parallel and adjacent to the sidewalls, extends through each corner, and has a short portion at each end lying parallel to the endwalls.



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SHEET 1 OF 2

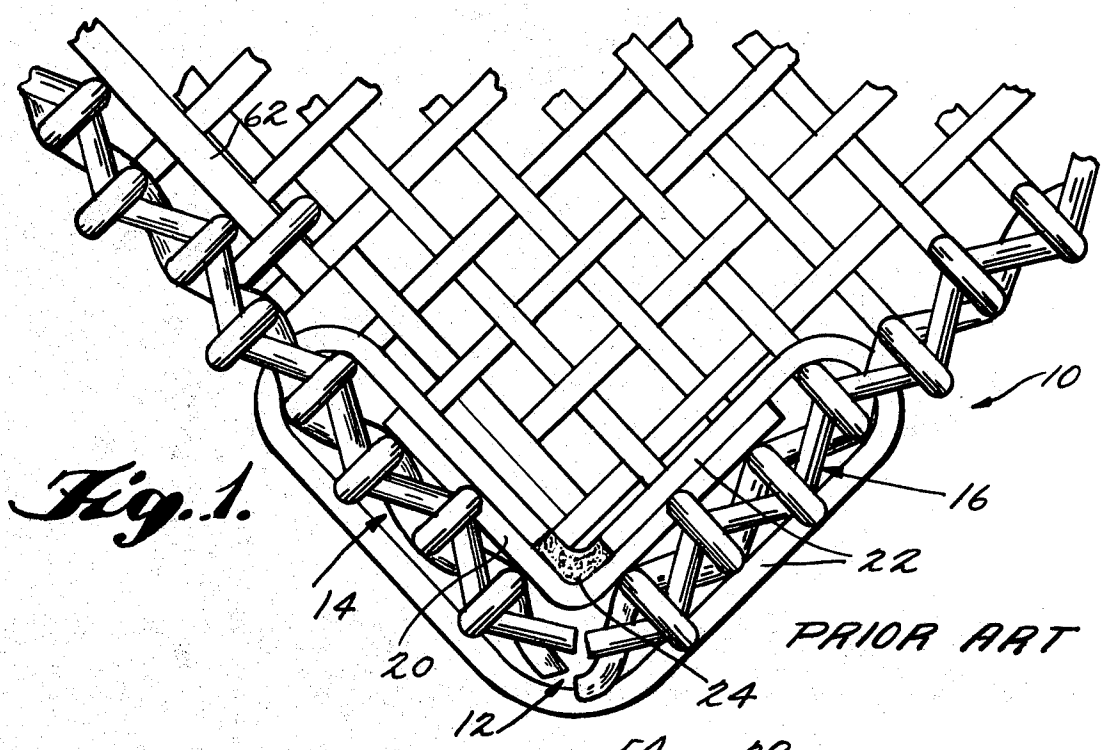


Fig. 1.

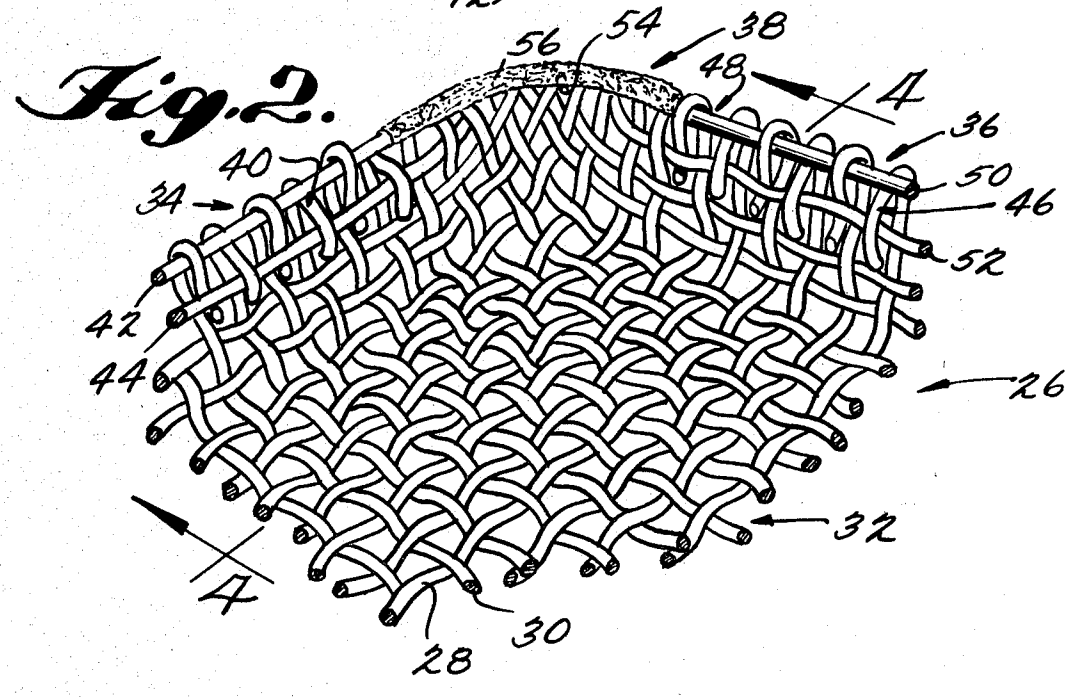


Fig. 2.

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Fig. 3.

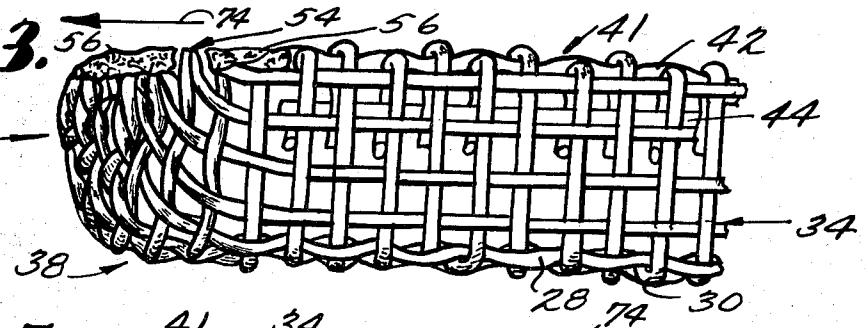


Fig. 4.

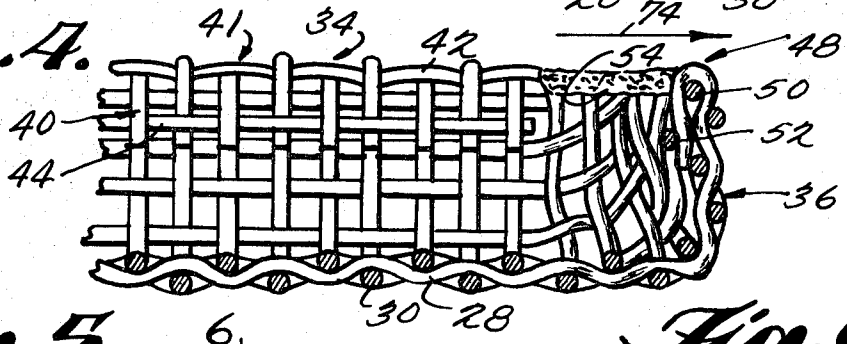


Fig. 5.

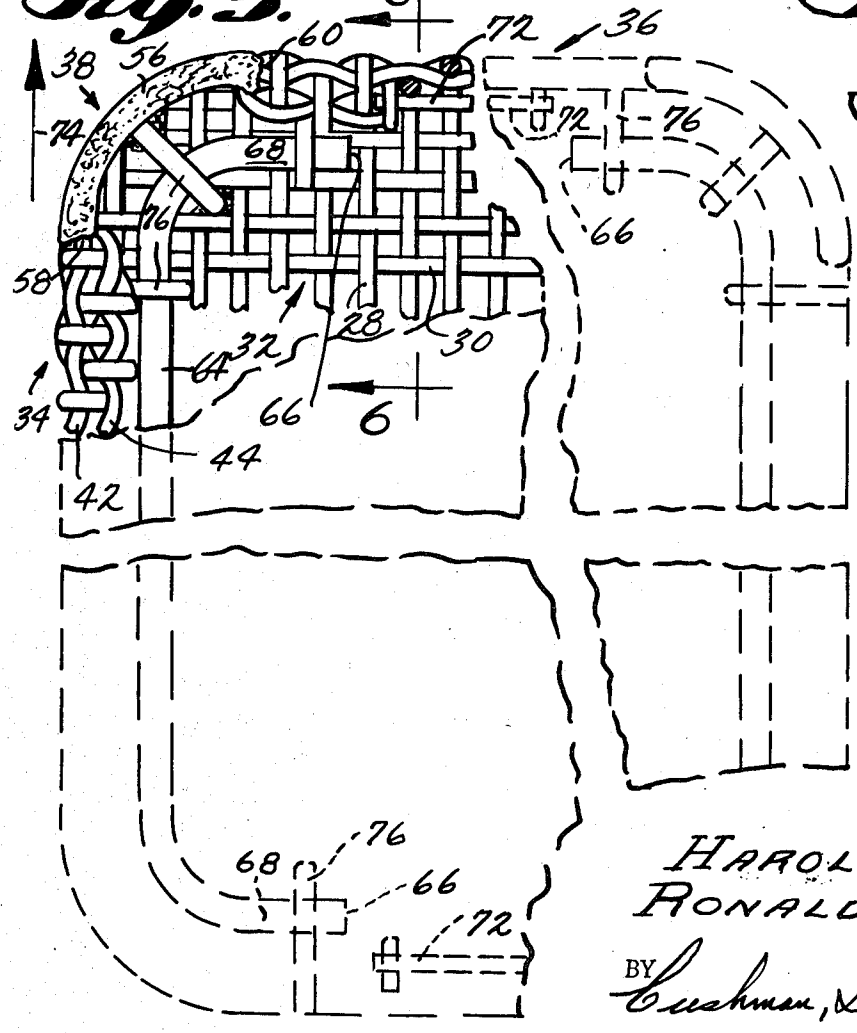
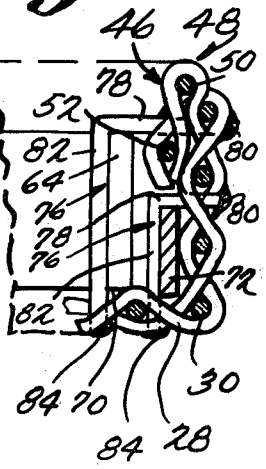


Fig. 6.



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WIRE CLOTH TRAY

This is a continuation of application Ser. No. 705,163 filed Feb. 13, 1968, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to a wire cloth tray and more particularly to a wire cloth tray for roller hearth heat treatment furnaces. Roller hearth furnaces might commonly employ rolls spaced 9—10 inches apart while the temperature in the furnace reaches between 2,050° F. and 2,100° F.

The construction of the prior art is discussed hereinafter in greater detail in relation to FIG. 1 of the drawings. The corners of these prior art trays are formed by notching out the corners of a flat piece of wire cloth, folding the sides up, and reinforcing and securing the corners ky means of metal angles and wire clips. The sidewalls and end walls are knuckled over, but knuckling is expensive since each wire must be curled separately. Moreover, knuckling limits to some degree the dimensions available for trays since the bending must take place at a point given width or length, the height of the sides is limited to the mesh count.

The corners of the prior art trays are held together by a metal angle and wire clip, and the cutting, bending and securing of the metal and wire clips at the corners is time consuming, expensive, and requires extra pieces of material. These corners present a basic problem when the tray is used in roller hearth furnaces. The corners are not continuous in strength at their bends. The wire clip is the only element holding the corners together while the metal angle helps retain the 90° shape of the corners. When the tray is under load and is subjected to the high temperatures found in a roller hearth furnace, the combination of the load and heat tends to spread the corners of the tray apart, to allow the leading edge to sag, and to cause general tray deformation. Upon occasion, the tray may tend to turn sideways in the furnace with the result that the spread corners or, for that matter, the right-angle corners are apt to hang up on the side of the furnace if they come in contact with it. This causes a furnace "wreck" in which trays and products are piled up within the furnace, which naturally causes extensive damage and considerable down time.

SUMMARY OF THE INVENTION

The invention relates to a woven wire cloth tray in which the wire cloth is gathered at each corner to form a rounded corner integrally connected to the end wall, the sidewall, and the bottom. The sidewalls and end walls are bent over at their upper extents to define their top edges. Preferably, the end walls and sidewalls are folded over inwardly to eliminate the cost of knuckling the individual wires. Each rounded corner is severed across its upper extent, and the severed edges are welded throughout their length.

The present invention provides a cheaper, stronger construction which eliminates the problems discussed above. The gathered rounded corners provide a continuous corner structure for the tray. This continuous structure helps support the width of the tray along the leading and trailing edges of the tray. The rounded corners also reduce furnace "wreck" possibilities. Not only is the tray stronger and more rigid, but the inherent flexibility of wire cloth for high-temperature use is maintained.

The invention also contemplates using longitudinal reinforcing bars which extend through the corners of the tray and extend for a short distance transversely of the tray and parallel to the end walls. These reinforcing members provide strength through the entire corner. The bars only extend transversely for a short distance in order to reduce the weight across the forward and rear ends of the tray since such ends are often unsupported and tend to sag under load and high temperatures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary plan view of the prior art;

FIG. 2 is a fragmentary perspective view taken from above and looking at the interior of a rounded gathered corner of the invention;

FIG. 3 is a fragmentary side elevational view of the tray;

FIG 4 is a fragmentary sectional view taken substantially along the line 4–4 of FIG. 2;

FIG 5 is a fragmentary plan view of the tray showing the positioning of reinforcing bars in the tray; and

FIG. 6 is a view taken substantially along the line 6–6 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 discloses a tray 10 constructed according to the prior art in which the corners 12 are notched out and the side and end walls (14 and 16) are then bent upwardly at approximately 90° from the bottom 18. The side and end walls come together at the corners, but the side and end walls are not integrally joined at the corners. A metal angle 20 is used to retain the 90° angle of each corner while a wire clip 22 holds the corners together. The free ends of the wire clip are in turn welded as at 24 to the metal angle 20. However, the corner tends to pull apart under load in a high-temperature furnace.

FIGS. 2—6 disclose the present invention. The tray 26 is constructed from a flat piece of woven wire cloth having interwoven longitudinal wires 28 and transverse wires 30. For example, the wire cloth may be comprised of 3 mesh of .105 inch diameter stainless steel wire. Initially, the piece of woven wire cloth is preferably rectangular or square. The corners are then preferably cut across on approximately a 45° angle and the entire piece of cloth is placed on a die. That portion of the cloth which eventually forms the bottom 32 is forced down into the die, not shown, thereby forming the sidewalls 34 and end walls 36 and the gathered rounded corners 38.

The sidewalls 34, end walls 36 and gathered corners 38 are described for illustration purposes as being separate structural elements, but it will be appreciated that the tray 26 is formed from a single piece of wire cloth. No cuts are formed into the interior of the cloth to accommodate the formation of the corners, as in the prior art. The corners, walls and bottom are all integrally connected.

The sidewalls 34 are folded upwardly from the bottom 32. The sidewalls are finished by bending over the upper portion 40 thereof to define the upper edge 41 of the sidewalls 34. The individual transverse wires could be knuckled over as illustrated in the plan view in FIG. 1. Thus, alternate transverse wires are bent inside and outside the sidewall. There are disadvantages and added costs to knuckling the sidewalls in this manner, as described above. The preferred embodiment is disclosed in FIGS. 2—6 in which the upper portion 40 of the sidewalls are folded over toward the interior of the ray and pressed against the inside of the sidewall. Thus, the uppermost longitudinal wire 42 in the sidewalls has every other transverse wire 30 crossing on top thereof. The folded upper portion 40 of the sidewalls normally includes at least one longitudinal wire 44 alternately engaged on opposite sides by the transverse wires 30 defining the sidewalls.

The end walls 36 are constructed in a similar manner. The end walls are folded upwardly from the bottom. The end walls are finished by bending over the upper portion 46 thereof to define the upper edge 48 of the end walls. The individual longitudinal wires could be knuckled over as illustrated in the plan view in FIG. 1. Thus, alternate longitudinal wires are bent inside and outside the end wall. For the reasons outlined above, the preferred embodiment, disclosed in FIGS. 2—6, has the upper portion 46 of the end walls folded over toward the interior of the tray and pressed against the inside of the end wall. Thus, the uppermost transverse wire 50 in the end walls has every other longitudinal wire crossing on top thereof. The folded upper portion 46 of the end walls normally includes at least one transverse wire 52 alternately engaged on opposite sides by the longitudinal wires defining the end walls.

The bent portions 40 and 46 of the sidewalls and end walls, respectively, give additional length and width support to the tray while including the inherent flexibility of woven wire cloth for high-temperature use. Bending avoids the use of welds across the top edges of the side and end walls of the tray.

Welds would transform the basket into a rigid structure in which it might be expected that the welds would fail during high-temperature use because of different expansion and contraction properties of the weld material and wire cloth. This is in contrast with the limited-area use of welds in the corners where welding is desirable for the reasons hereinafter set forth.

It is also contemplated that additional reinforcing stiffeners, not shown, could be inserted between the side and end walls and the corresponding folded portions. This would make the upper edges of the side and end walls wider with the result that extra stiffness is provided along these edges.

Each corner is provided with a gathered rounded corner **38**. That is, the longitudinal and transverse wires, **28** and **30**, are gathered and drawn upwardly to form a rounded, continuous corner. The gathered corner is obviously integrally connected to the side and end walls and the bottom. Instead of the upper portion of the rounded corners being folded or knuckled over, the rounded corners are severed across the upper extents thereof. As illustrated, each corner is severed so that it is of approximately the same height as the adjacent side and end walls. The severed edges **54** of each rounded corner are welded throughout the length of the rounded corner so as to connect all of the severed wires of each corner. Welding not only provides some strength to the corner, but it also prevents the ends from fraying or unraveling, and it serves as a finishing device. The welding material **56** used in the rounded corners preferably engages the uppermost longitudinal wire **42** of the sidewalls and the uppermost transverse wire **50** of the end walls, as at **58** and **60** respectively. If the upper portions of the gathered corners were knuckled or folded over, the individual wires of the corners might come unraveled. Moreover, such knuckling or folding would produce bulk of material in the corners thereby preventing reinforcing bars from fitting in closely to the corners, as described hereinafter.

When the tray is used in high-temperature operations, it tends to deform under the load therein and even under the weight of the tray itself. As a means of reducing deformation, reinforcing bars may be used. In the prior art, as shown in FIG. **1**, such reinforcing bars **62** extend along the wall of the tray and terminate short of the corners. As illustrated in FIG. **5**, the preferred embodiment of the tray includes a longitudinal reinforcing bar **64** extending the length of the sidewall **34** of the tray. The reinforcing bar is turned through or bent around the corner with the free ends **66** of the longitudinal reinforcing bar extending transversely of the tray and approximately parallel to the end walls **36**. It will be noted that while this reinforcing bar is referred to as a longitudinal reinforcing bar, it includes transverse components **68** after it turns through each corner. The turn through each corner is important in that the transverse components **68** keep the bar upright by preventing twisting so as to obtain the maximum bending strength of the bar. As shown in FIG. **6**, the bar is rectangular in cross section and its narrow edge **70** rests on the bottom **32** of the tray. Reinforcement through a complete turn of the corner is also provided by this construction. The bar is not welded to the tray so that so that the tray and bar can expand and contract separately. Inasmuch as the wire cloth material is lighter than the reinforcing bar, it heats up more rapidly than the reinforcing bar. Provision is also made for a transverse reinforcing bar **72**, which preferably fits approximately between the free ends **66** of the longitudinal reinforcing bar. As illustrated, the transverse reinforcing bar fits adjacent to the end wall and below the folded portion thereof.

The direction of movement of the tray is shown by the arrows **74** in FIGS. **3—5**. If the forward end of the tray were subjected to considerable weight, it would sag across its transverse width as ti came across one of the rollers in a roller hearth furnace. If the sag became too great, the tray could catch on the next roller. Therefore, it is desirable to minimize the weight at the leading and trailing edges of the tray. According, the reinforcing bar **72** preferably has a smaller cross-sectional area than the longitudinal reinforcing bar and is accordingly lighter in weight.

L-shaped clips **76** are used to fasten the reinforcing bars to respective walls. The clips **76** are positioned against the reinforcing bars to hold the same against the wall of the tray. The shorter leg **78** of the clips pass over the narrow top edge of the reinforcing bars and pass through the wall of wire cloth tray to be preferably welded on the outside surface of the wall, as at **80**. The welds are then preferably ground flush. The longer leg **82** of the clips pass through the bottom of the tray and are preferably welded on the outside surface of the bottom, as at **84**. The welds are then preferably ground flush.

It is anticipated that the concepts embodied in the rectangular tray described herein could be employed for other different general shapes which could incorporate continuous corners. The trays can naturally be employed for uses other than high-temperature uses. In such cases, there would be little need for the reinforcing bars.

The trays described and claimed herein are defined as being made from wire cloth having interwoven longitudinal and transverse wires. The longitudinal wires are defined as extending perpendicular to the end walls and the transverse wires are defined as extending perpendicular to the sidewalls. It will be appreciated that such terms are used for descriptive purposes only and that the sidewalls could be shorter in length than the end walls. In such a case, the "longitudinal" wires would be shorter than the "transverse" wires.

While a preferred from of the invention has been illustrated in the drawings and discussed above, it should be adequately clear that considerable modification may be made thereto without departing from the principles of the invention.

We claim:

1. A tray formed of woven wire cloth having interwoven longitudinal wires and transverse wires comprising:

a woven wire cloth bottom;

upwardly extending woven wire cloth sidewalls integrally connected to the bottom;

upwardly extending woven wire cloth end walls integrally connected to the bottom, one of the end walls defining the leading edge of the tray;

a gathered woven wire cloth rounded corner integrally connecting the forward end wall to the respective sidewalls at each forward corner, the gathered woven wire cloth rounded corner being integrally connected to the bottom; and

the sidewalls and end walls being bent over at the upper extent of each to define the top edges of the sidewalls and end walls, and each rounded corner being severed across the upper extent thereof to define the top edge thereof, the top edge of each rounded corner being welded throughout its length to connect all of the respective severed wires of each corner.

2. The tray defined in claim **1** additionally comprising a gathered woven wire cloth rounded corner at each rear corner integrally connecting the rear end wall to the respective sidewalls and being integrally connected to the bottom, each rear gathered corner being severed across the upper extent thereof to define the top edge thereof, the top edge of each rear rounded corner being welded throughout its length to connect all of the respective severed wires of each corner.

3. The tray defined in claim **2** wherein the end walls and sidewalls are folded over inwardly.

4. The tray defined in claim **2** wherein the individual longitudinal wires and transverse wires of the end and sidewalls respectively are knuckled over.

5. The tray defined in claim **2** wherein the uppermost transverse wire in the end walls and the uppermost longitudinal wire in the sidewalls are engaged by the weld material defining the top edges of the rounded corners.

6. The tray defined in claim **5** wherein all of the longitudinal wires in the end walls and transverse wire in the sidewalls are bent inwardly and wherein every other longitudinal wire in the end walls passes over the uppermost transverse wire of the respective end walls and wherein every other transverse wire in the sidewalls passes over the uppermost longitudinal wire of the respective sidewalls.

7. The tray defined in claim 2 additionally comprising a pair of longitudinal reinforcing bars, the reinforcing bars being mounted within the tray and secured to the walls thereof, and each longitudinal reinforcing bar extending the length of the respective sidewalls and being turned through each corner with the free end portions of each reinforcing bar extending transversely and approximately parallel to the respective end walls, and the free end portions of opposed reinforcing bars being transversely disposed from each other.

8. The tray defined in claim 7 wherein the longitudinal reinforcing bars have a rectangular cross section and wherein the narrow edge of each bar is seated on the bottom of the tray.

9. The tray defined in claim 8 wherein the reinforcing bars are held in place by a plurality of inverted L-shaped members, the free end of the long leg of each L-shaped member being secured to the bottom and the short leg extending across the upper narrow edge of the reinforcing bar and being secured to a wall of the tray.

10. The tray defined in claim 7 additionally comprising a pair of transverse reinforcing bars mounted within the tray and secured to the respective end walls thereof, the transverse reinforcing bars extending between the transversely extending, opposed free ends of the longitudinal reinforcing bars.

11. The tray defined in claim 10 wherein the transverse reinforcing bars are of smaller cross-sectional area than the cross-sectional area of the longitudinal reinforcing bars.

12. The tray defined in claim 10 wherein the transverse reinforcing bars lie adjacent the end walls and underneath the bent over portion of the end walls.

13. A tray formed of woven wire cloth having interwoven longitudinal wires and transverse wires comprising:

a woven wire cloth bottom;

upwardly extending woven wire cloth sidewalls integrally connected to the bottom;

upwardly extending woven wire cloth end walls integrally connected to the bottom, the end walls being operatively joined to the bottom, the end walls being operatively joined to the respective sidewalls at each corner of the tray;

a pair of longitudinal reinforcing bars mounted against and contiguous with the sidewalls of the tray, each longitudinal reinforcing bar extending the length of the respective sidewalls and being turned through each corner with the free end portions thereof extending transversely and approximately parallel to the respective end walls, and the free end portions of opposed reinforcing bars being transversely disposed from each other; and

means secured to the tray for holding the reinforcing bar against the sidewalls of the tray, the holding means adapted to permit relative movement between the bar and the sidewall, such relative movement arising from different rates of expansion and contractions in heat treatment operations.

14. The tray defined in claim 13 wherein the longitudinal reinforcing bars have a rectangular cross section and wherein the narrow edge of each bar is seated on the bottom of the tray.

15. The tray defined in claim 14 wherein the reinforcing bars are held in place by a plurality of inverted L-shaped members, the free end of the long leg of each L-shaped member being secured to the bottom and the short leg extending across the upper narrow edge of the reinforcing bar and being secured to a wall of the tray.

16. The tray defined in claim 13 additionally comprising a pair of transverse reinforcing bars mounted within the tray and secured to the respective end walls thereof, the transverse reinforcing bars extending between the transversely extending, opposed free ends of the longitudinal reinforcing bars.

17. The tray defined in claim 16 wherein the transverse reinforcing bars are of smaller cross-sectional area than the cross-sectional area of the longitudinal reinforcing bars.

18. The tray defined in claim 13 additionally comprising gathered woven wire cloth rounded corner integrally connected to the bottom and integrally connecting each end wall to the adjacent sidewalls.

19. The tray defined in claim 18 wherein the sidewalls and end walls are bent over at the upper extent of each to define the top edges of the sidewalls and end walls, and wherein each rounded corner is severed across the upper extent thereof to define the top edge thereof, the top edge of each rounded corner being welded throughout its length to connect all of the respective severed wires of each corner.

20. The tray defined in claim 19 wherein the end walls and sidewalls are folded over inwardly.

21. The tray defined in claim 13 wherein the reinforcing bars are mounted on the inside of the sidewalls of the tray.

22. A tray formed of woven wire cloth having interwoven longitudinal wires and transverse wires comprising:

a woven wire cloth bottom;

upwardly extending woven wire cloth sidewalls integrally connected to the bottom;

upwardly extending woven wire cloth end walls integrally connected to the bottom, one of the end walls defining the leading edge of the tray;

a gathered woven wire cloth rounded corner integrally connecting the forward end wall to the respective sidewalls at each forward corner, the gathered woven wire cloth rounded corner being integrally connected to the bottom; and

each rounded corner being severed across the upper extent thereof to define the top edge thereof, the top edge of each rounded corner being welded throughout its length to connect all of the respective severed wires of each corner.

23. The tray defined in claim 22 additionally comprising a gathered woven wire cloth rounded corner at each rear corner integrally connecting the rear end wall to the respective sidewalls and being integrally connected to the bottom, each rear gathered corner being severed across the upper extent thereof to define the top edge thereof, the top edge of each rear rounded corner being welded throughout its length to connect all of the respective severed wires of each corner.

24. The tray defined in claim 22 wherein the sidewalls and end walls are bent over at the upper extent of each to define the top edges of the sidewalls and end walls.

Disclaimer

3,559,836.—*Harold E. Pink* and *Ronald G. Daringer*, Cambridge, Md. WIRE CLOTH TRAY. Patent dated Feb. 2, 1971. Disclaimer filed Feb. 10, 1972, by the assignee, *Cambridge Wire Cloth Company.*

Hereby enters this disclaimer to claims 22 and 23 of said patent.

[*Official Gazette June 27, 1972.*]