July 14, 1953 P. S. MENOUGH 2,645,472

FABRICATED METAL CONTAINER

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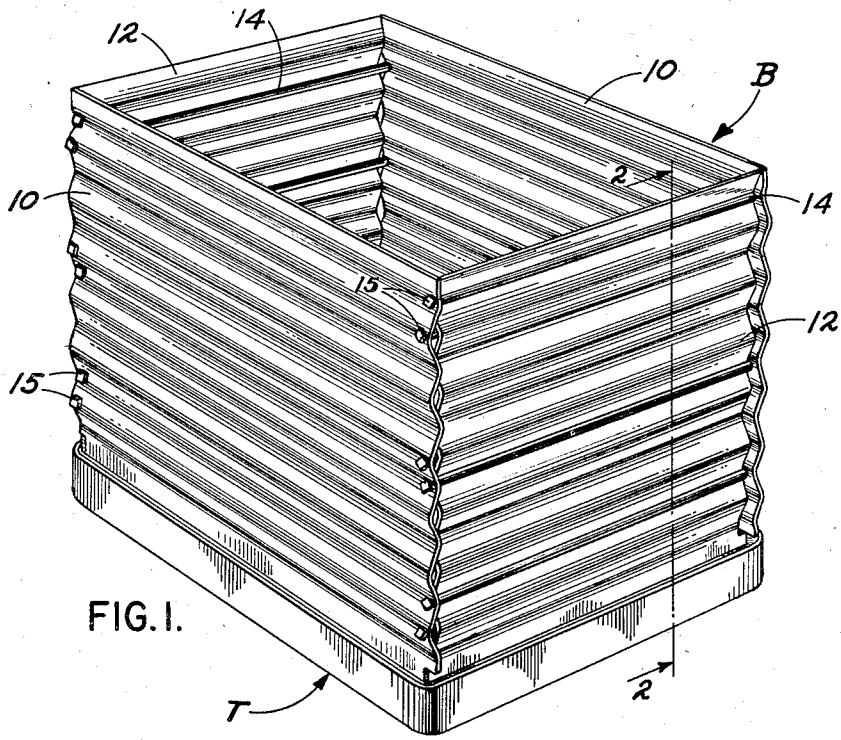


FIG. 1.

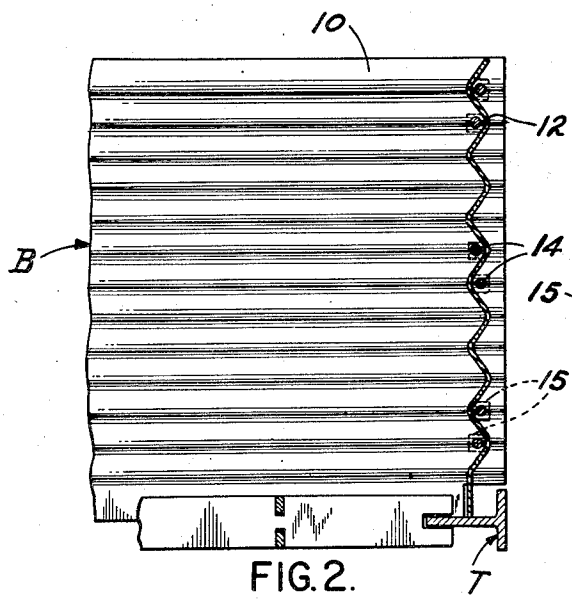
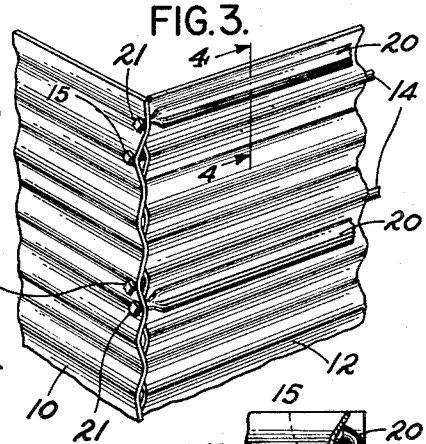


FIG. 2.

FIG. 3.



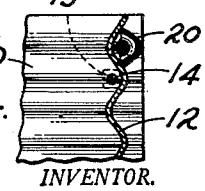


FIG. 4.

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FABRICATED METAL CONTAINER

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11 Claims. (Cl. 263—49)

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The present invention relates generally to means for supporting and maintaining in position metal parts carried on trays which are pushed end to end through long-tunnel annealing furnaces, and is more particularly concerned with a unique annealing box intended to stand on top of such trays and to enclose and maintain in position bulk loads carried by the trays.

Conventional boxes for use with annealing trays are either one piece castings or made up of several cast pieces which are hinged together at the corners by means of lugs and pins. In either case, the box is subject to failure and soon fails in use because of the temperature shocks to which it is subjected. Most commonly this failure takes the form of breaks at the corners where the box is subject to the greatest stress due to rapid expansion or contraction resulting from these shocks. This shortcoming of the conventional devices has been endured because attempts heretofore to avoid it have resulted only in more serious difficulties. According to one proposal, for example, these boxes would be constructed of such thin section that they could substantially better stand the thermal shocks due to the possibility of more rapidly heating and cooling the entire box. However, if the sections are thin enough to enable an approach to this objective, the boxes resulting are so weak that they will not retain their shapes, particularly when they are in the hot zone of an annealing line.

It is accordingly a primary object of this invention to provide an annealing box which is both as strong as necessary for the conventional use aforementioned and is also entirely free from the failure tendencies of the prior art devices, and particularly corner structure failure, attributable to thermal shocks involved in ordinary use.

It is a further object of this invention to provide an annealing box which has substantially longer useful life than any annealing box heretofore known.

It is another object of my present invention to provide an annealing box combining unusual flexibility characteristics with strength and resistance to forces tending to deform the device, whereby the box may yield under forces which would break heretofore conventional boxes and yet will withstand these same forces to prevent deformation of the box beyond the point where it can serve its intended purpose and also return to its original shape when the stresses are relieved.

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It is a further object of my invention to provide an annealing box which is free from the foregoing shortcomings of the prior art and yet is made of high alloy steels.

It is still another object of my invention to provide annealing boxes which are lighter and easier to handle than those of the prior art and which require substantially less maintenance than said prior art devices.

It is still a further object of this invention to provide annealing boxes which are readily made with a minimum number of simple and relatively inexpensive parts without requiring elaborate special equipment or skills whereby the cost of these boxes may be maintained at a minimum comparing favorably with the cost of any heretofore conventional and commercial devices of this type.

Those skilled in the art will gain a further understanding of this invention and of the additional objects and advantages of this invention upon consideration of the following detailed description, taken in conjunction with the drawings accompanying and forming a part of this specification, in which:

Fig. 1 is a perspective view of an annealing tray and a box embodying this invention in a preferred form, the box being in the normal position with respect to the annealing tray to maintain the tray load in place;

Fig. 2 is a vertical sectional view taken on line 2—2 of Fig. 1, showing the relative positions of the tie members and the end wall members of the box;

Fig. 3 is a fragmentary, perspective view of another box embodying this invention, parts being broken away to shown the form and relationship of several elements of the box; and,

Fig. 4 is a vertical, sectional view taken on line 4—4 of Fig. 3.

Generally, a device embodying this invention comprises a pair of metal sheets which are spaced apart to constitute opposed walls of a box, and a second pair of sheet metal elements spaced apart, opposed and located between the first pair and cooperating with them to define a four-sided open vessel. All four sheets of this assembly are movable within predetermined limits relative to each other and means are provided comprising a plurality of tie members extending between and connecting the first pair of sheets for maintaining the assembled sheets in position relative to each other within the aforesaid predetermined limits. These tie members are arranged in two groups which are spaced apart and one of

these second pair sheets is disposed between individual tie members of one group while the other sheet is similarly related to the ties of the other group.

More particularly and with reference to the foregoing drawings, a typical box B of this invention comprises two corrugated metal sheets 10 of substantially the same dimensions, these sheets being spaced apart and opposed to define the side walls of the box. The box end walls are defined by a pair of corrugated sheets 12, suitably of the same stock as the sheets 10 but cut into shorter lengths and disposed between and at substantially right angles to sheets 10 and bearing against said sheets adjacent to the ends thereof to define an open-ended box. The corners of this box thus are open between points of engagement of the corrugations of sheets 10 and 12. The upper and lower edge portions of sheets 10 and 12 are in two substantially parallel common planes so that the box may be placed upright on an annealing tray T to enclose and stabilize in position on tray T a typical load of a number of metal parts to be annealed.

Box B is held together and in shape by means of twelve tie rods 14 arranged in two groups of six disposed at each end of the box. Tie rods 14 are arranged in pairs at the upper, the intermediate and the lower portions of the box and are nested in adjacent corrugations of sheets 12. Tie rods 14 extend through holes provided for the purpose in the end portions of sheets 10 and are retained in place by means of enlarged portions or heads 15 which are provided at the extremities of the rods 14 to engage the outside surfaces of sheets 10. Preferably, the tie rods are not welded to the side wall sheets or to the end wall sheets, but are spaced from but engageable loosely with the side wall sheets and likewise heads 15 normally engage the outside surfaces of sheets 12 only part of the time. Thus in the preferred embodiment of this invention, the tie rods are of a slightly greater free length between heads 15 than necessary to assure constant firm engagement of sheets 10 and 12 with each other. This arrangement permits expansion of sheets 12 without the creation of stresses in them, or in sheets 10, or in the tie rods. This result, of course, may be obtained regardless of the manner in which the tie rods are headed, the free or effective length of these rods between their heads being the controlling factor.

With reference to Figs. 3 and 4, the box illustrated is generally similar to that of Figs. 1 and 2 and comprises two, spaced, opposed corrugated metal sheets 10 constituting the side walls of the box, a pair of spaced, opposed, corrugated metal sheets 12 constituting the ends thereof and means for holding the sheets in their assembled position while allowing relative movement of the sheets within predetermined limits, as set out above. This means comprises six tie rods 14 having head portions 15 and being related to the sheets 10 as described above. These tie rods 14, however, are disposed only on the inside of the box being nested in spaced corrugations of the end wall sheets 12. On the outer sides of these end wall sheets tie rods 20 having head portions 21 similar to heads 15 are provided, being nested in corrugations adjacent to those in which tie rods 14 are disposed on the opposite sides of sheets 12. Tie rods 20 differ from tie rods 15 essentially in that while the former are rods or bars of substantially uniform diameter, the latter are of generally U-shape except at their ends where they are tapered into substantially cylindrical round form so that they may be used interchangeably with rods 14 to pass through the openings provided for rods 14 in the side wall sheets 10. Thus, the longitudinally extending edge portions of U-shaped parts of a typical rod 20 bear against the upward slopes or sides of a corrugation valley, as indicated in Fig. 4. By virtue of this construction, the tendency of the end wall sheets 12 to bulge outwardly under pressure applied as the tray and its box are pushed through the furnace with the end walls extending parallel to the direction of travel is overcome and undesirable distortion of the box is prevented.

It will be understood from the foregoing description that both the illustrated embodiments of this invention will afford all the advantages over the art stated above, and will meet all the foregoing objectives of this invention. It will also be clear that these boxes of my invention may be used as easily as those of the prior art, and probably more easily because of their unusually light weight. Furthermore, these devices of mine are not open to a sufficient degree at their corners that the chimney effect usually desired in annealing boxes is diminished to any objectionable or even noticeable extent. Surprisingly, it is even possible to employ the boxes of this invention in the heat treating of white cast iron parts without distorting, warping or deforming these boxes in any way. In accordance with the prior art, special precautions had to be taken with respect to white cast iron parts to prevent any or all of these results because of the well-known permanent expansion characteristic of this metal.

Having thus described the present invention so that those skilled in the art may be able to gain a better understanding and practice the same, I state that what I desire to secure by Letters Patent is defined in what is claimed.

What is claimed is:

1. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of metal sheets spaced apart and constituting opposed walls of the container, a second pair of opposed spaced metal sheets disposed between the first pair and cooperating therewith to define a four-sided open-ended vessel, said sheets being movable within predetermined limits relative to each other, and means comprising a plurality of tie members extending between and connecting said first pair of metal sheets for maintaining all the metal sheets in position relative to each other within said predetermined limits, some of said tie members being disposed inside the container and the other tie members being disposed outside thereof, and said second pair of sheets each being disposed between tie members in the container and tie members outside said container.

2. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of corrugated metal sheets spaced apart and constituting opposed walls of the container, a second pair of opposed spaced corrugated metal sheets disposed between the first pair and cooperating therewith to define a four-sided open-ended vessel, said sheets all being movable within predetermined limits relative to each other and having their end portions disposed substantially adjacent to define corners

of the vessel, and means comprising a plurality of tie members extending between and connecting said first pair of metal sheets for maintaining all the metal sheets in position relative to each other within said predetermined limits, some of said tie members being disposed inside the container and the other tie members being disposed outside thereof, and said second pair sheets each being disposed between tie members in the container and tie members outside said container.

3. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of metal sheets spaced apart and constituting opposed walls of the container, a second pair of opposed spaced metal sheets provided with corrugations and disposed between the first pair and cooperating therewith to define a four-sided open-ended vessel, said sheets all being movable within predetermined limits relative to each other, and means comprising a plurality of tie members extending between and connecting said first pair of metal sheets for maintaining all the metal sheets in position relative to each other within said predetermined limits, said members being arranged in two groups nested in the corrugations of the second sheet pair and disposed on opposite sides of each second pair sheet.

4. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of metal sheets spaced apart and constituting opposed walls of the container, a second pair of opposed spaced metal sheets disposed between the first pair and cooperating therewith to define a four-sided open-ended vessel, said sheets all being movable within predetermined limits relative to each other and having lower edge portions substantially in a common plane to rest upon said tray, and means comprising a plurality of tie members extending between and connecting said first pair of metal sheets for maintaining all the metal sheets in position relative to each other within said predetermined limits, some of said tie members being disposed inside the container and the other tie members being disposed outside thereof, and said second pair sheets each being disposed between tie members in the container and tie members outside said container.

5. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of opposed metal sheets spaced apart and defining side walls of the container, a second pair of opposed spaced metal sheets between the side walls and defining end walls of the vessel, said sheets all being movable within predetermined limits relative to each other, and means comprising a plurality of tie members extending between and connecting the side wall sheets for maintaining the side and end wall sheets in position relative to each other within said predetermined limits, some said tie members being extended through the container and the remainder of said tie members being disposed outside the container, and said end wall sheets being engageable with tie members disposed inside and tie members disposed outside the container.

6. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of metal sheets spaced apart and defining side walls of the container, a second pair of opposed spaced metal sheets between the side walls provided with corrugations and defining end walls of the vessel, said sheets being movable within predetermined limits relative to each other, and means comprising a plurality of tie members extending between and connecting the side wall sheets for maintaining the side and end wall sheets in position relative to each other within said predetermined limits, said tie members being nested in the corrugations of said end wall sheets and disposed on opposite sides of each said end wall sheet.

7. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of opposed metal sheets spaced apart and defining side walls of the container, a second pair of opposed spaced metal sheets provided with corrugations and disposed between and bearing against the side walls and defining end walls of the vessel, said sheets being movable within predetermined limits relative to each other, and means comprising a plurality of tie members extending between and connecting the side wall sheets for maintaining the side and end wall sheets in position relative to each other within said predetermined limits, said tie members being nested in the corrugations of said end wall sheets and disposed on opposite sides of each said end wall sheet.

8. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of corrugated metal sheets spaced apart and constituting opposed walls of the container, a second pair of opposed spaced corrugated metal sheets disposed between and bearing against the side walls and defining end walls of the vessel, said sheets being movable within predetermined limits relative to each other and having lower edge portions substantially in a common plane to rest upon said tray, and means comprising a plurality of tie members extending between and connecting said first pair of metal sheets for maintaining the side and end wall sheets in position relative to each other within said predetermined limits, said tie members being nested in the corrugations of said end wall sheets and disposed on opposite sides of each said end wall sheet.

9. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of metal sheets spaced apart and constituting opposed walls of the container, a second pair of opposed spaced metal sheets disposed between the first pair and cooperating therewith to define a four-sided open-ended vessel, said sheets being movable within predetermined limits relative to each other, and means comprising a plurality of tie members extending between and connecting said first pair of metal sheets for maintaining all the metal sheets in position relative to each other within said predetermined limits, said second pair sheets each being disposed between and engageable with individual tie members disposed on opposite sides of each said second sheet.

10. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of metal sheets spaced apart and constituting opposed walls of the container, a pair of opposed spaced corrugated metal sheets disposed between the first pair and cooperating therewith to define a four-sided open-ended

vessel, said sheets all being movable within predetermined limits relative to each other, and means comprising a plurality of tie members extending between and connecting said first pair of metal sheets for maintaining all the metal sheets in position relative to each other within said predetermined limits, said tie members being nested in the corrugations of said corrugated sheets and disposed on opposite sides of each said corrugated sheet, and said tie members each having intermediate portions bearing against said corrugated sheets and end portions extending through and engaging said first pair sheets.

11. A fabricated metal box-like container for use with an annealing tray to surround and maintain in position a load carried by the tray comprising a pair of corrugated metal sheets spaced apart and constituting opposed walls of the container, a second pair of opposed spaced corrugated metal sheets disposed between the first pair and cooperating therewith to define a four-sided open-ended vessel, said sheets all being movable within predetermined limits relative to each other and having their end portions disposed substantially adjacent to define corners

of the vessel, means comprising a plurality of tie members disposed outside of said container and extending between and connecting said first pair of metal sheets for maintaining all the metal sheets in position relative to each other within said predetermined limits and for reinforcing the container against distorting forces, and means engaging intermediate portions of the inner sides of said second pair of sheets and cooperating with the tie members to maintain the second pair of sheets in upright position and opposing forces tending to buckle said second pair of sheets inwardly in their intermediate portions.

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