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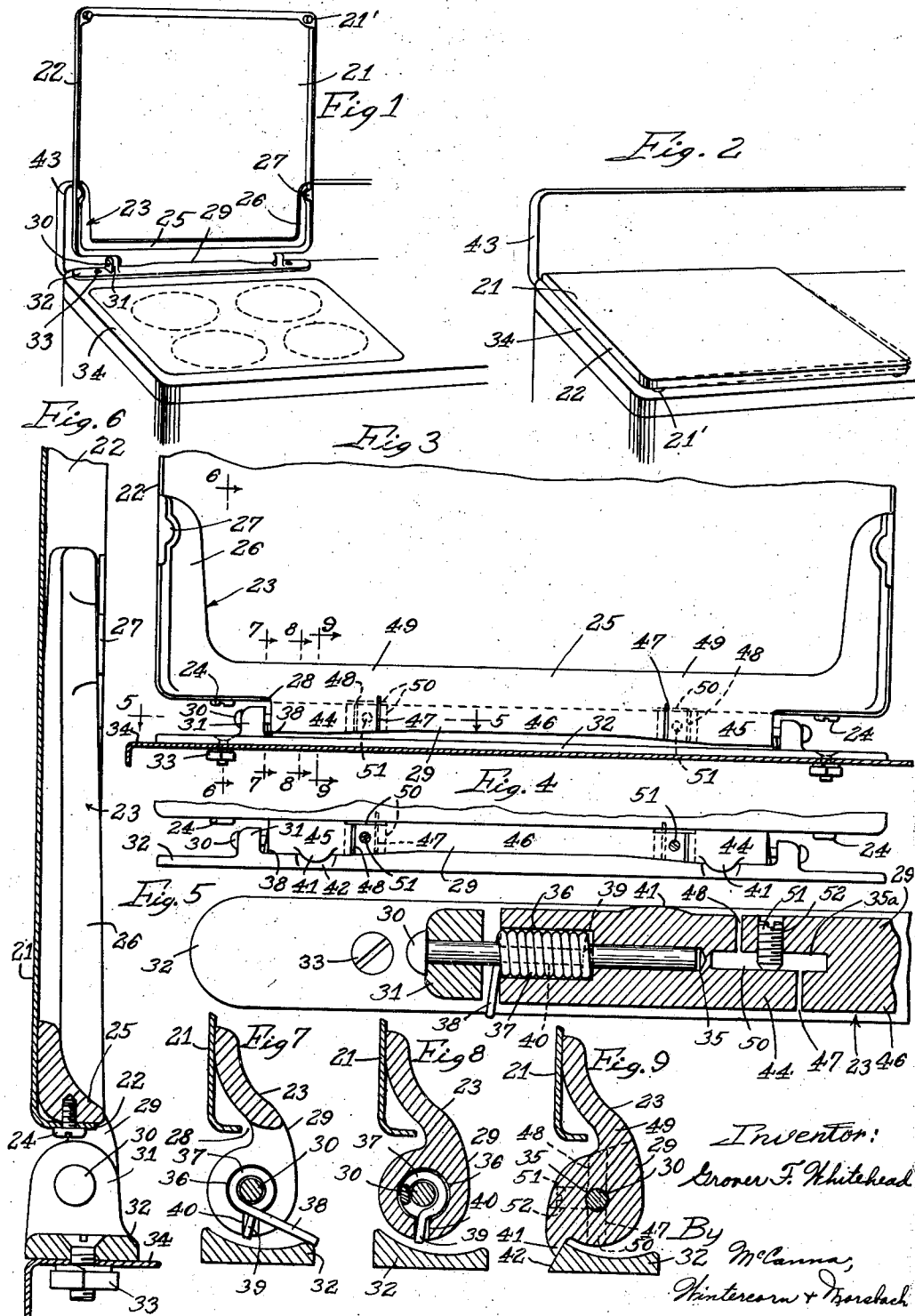
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2,335,328

COMBINATION HINGE MEMBER AND WARPAGE COMPENSATOR FOR HINGED PANELS

Filed Nov. 27, 1939

3 Sheets-Sheet 1



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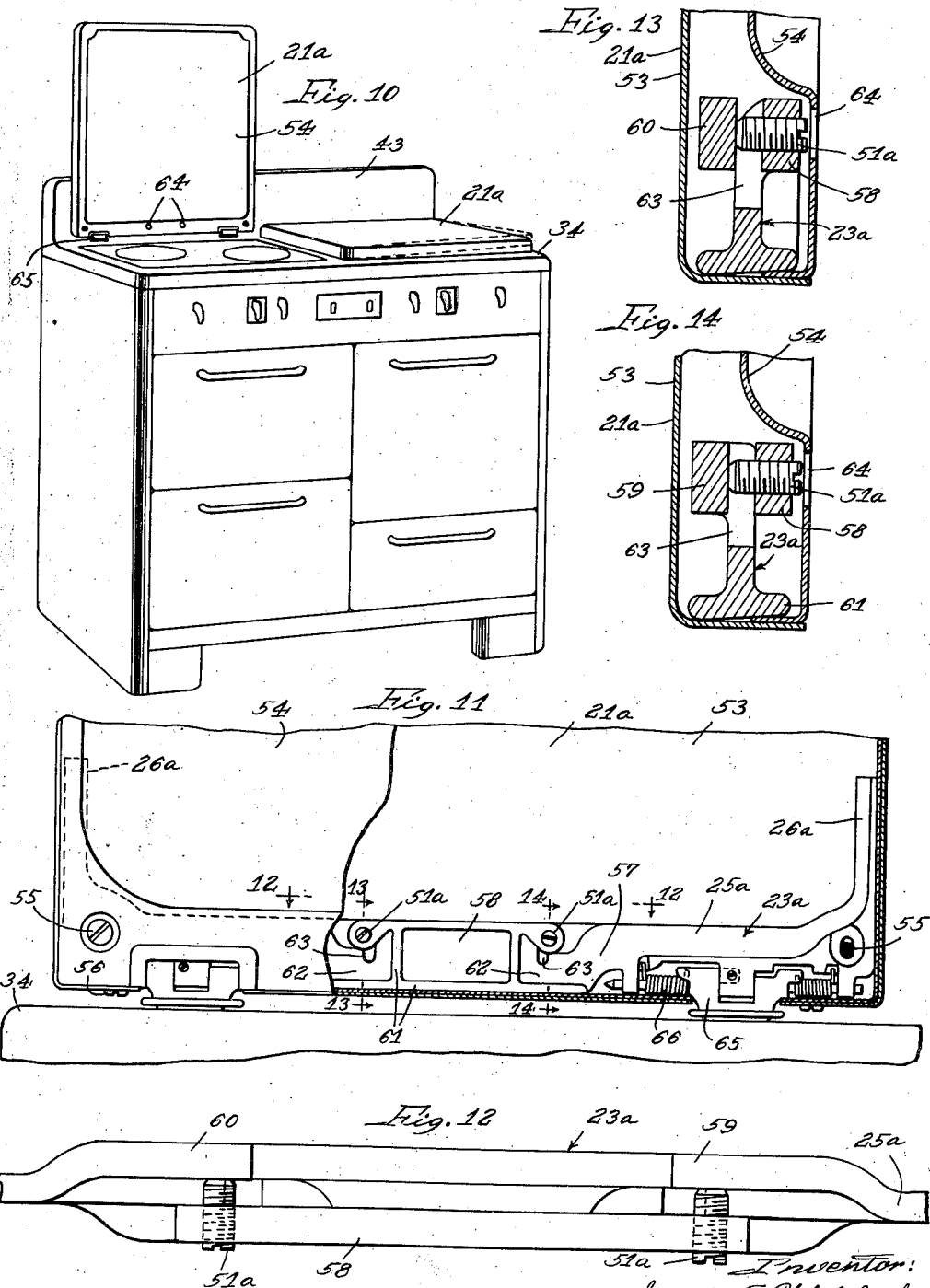
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COMBINATION HINGE MEMBER AND WARPAGE COMPENSATOR FOR HINGED PANELS

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3 Sheets-Sheet 2



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COMBINATION HINGE MEMBER AND WARPAGE COMPENSATOR FOR HINGED PANELS

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3 Sheets-Sheet 3

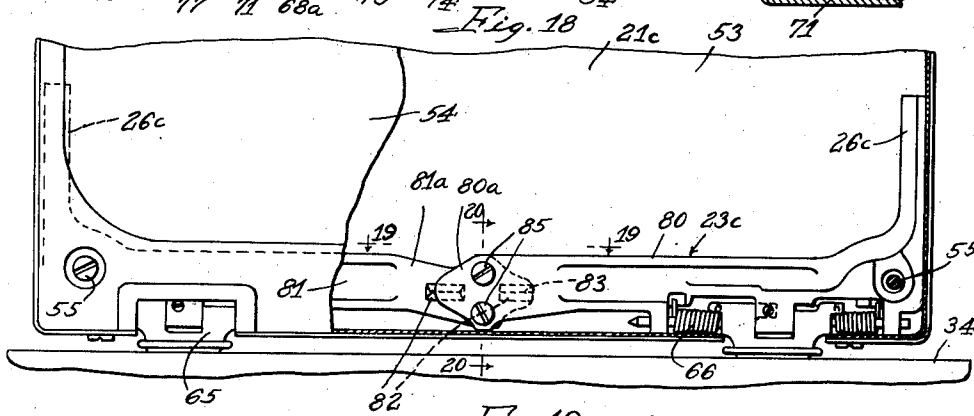
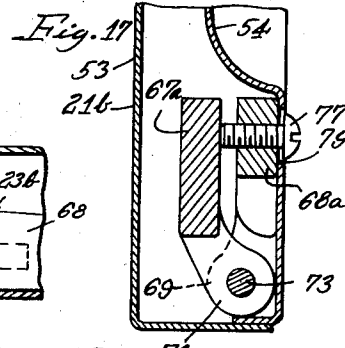
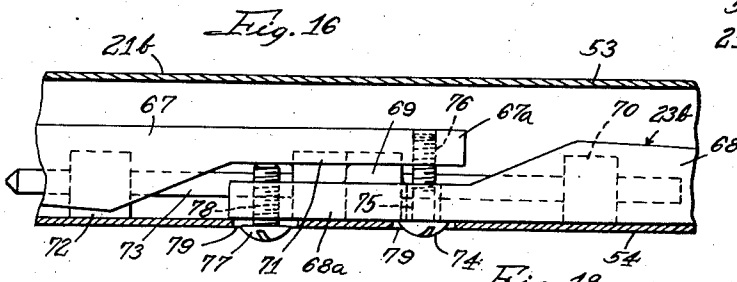
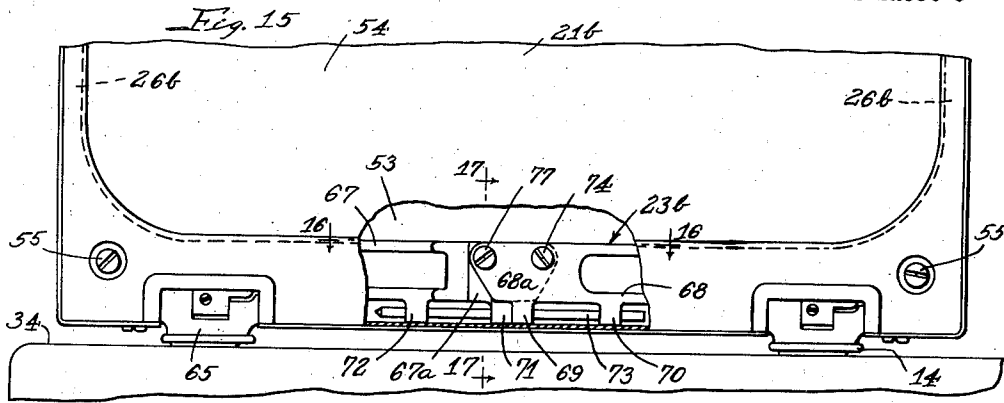
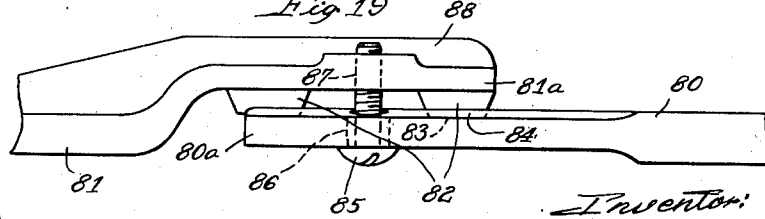
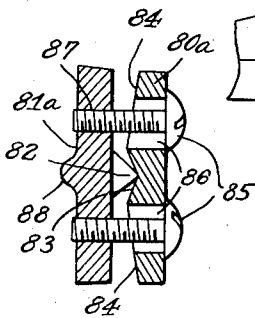


Fig. 20



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UNITED STATES PATENT OFFICE

2,335,328

COMBINATION HINGE MEMBER AND WARP-
AGE COMPENSATOR FOR HINGED PANELSGrover F. Whitehead, Rockford, Ill., assignor to
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Application November 27, 1939, Serial No. 306,334

16 Claims. (Cl. 20-38)

This invention relates to a method of and means for eliminating the distortion in warped objects such as sheet metal door and lid panels for cooking ranges, and is more particularly concerned with a warpage compensator incorporated in a hinge member adapted to be mounted on such panels.

In the manufacture of door and lid panels for ranges and other sheet metal cabinets, a serious problem is presented by the tendency for these sheet metal panels to warp to a twisted form so that doors don't close properly and lids don't lie flat and as a result the range or other cabinet presents a cheap and unsightly appearance. The procedure followed heretofore consisted merely in efforts toward minimizing warpage by keeping the panels absolutely rigid in the desired shape during the heating operation incidental to enamelling, but besides being awkward and expensive this method has been unsatisfactory for the reason that it is not possible to control the panel properly during the whole process and consequently some warpage still occurs.

It is therefore the principal object of my invention to provide a novel method of and means for eliminating distortion in panels and the like, which makes it unnecessary to take any special precautions in the enamelling process and results in a saving in cost while also assuring uniformly straight panels.

Another object is to provide means of the kind mentioned incorporating screw adjustments for forcing warped panels into the desired shape and retaining them in that shape, the screws being easily adjustable to just the right degree and to obtain an adjustment in either direction as a given panel may require.

Another important object consists in the embodiment of the warp adjustment screws and stress transmitting members operable thereby as small and inconspicuous portions of the hinge members used for hinged mounting the panels on the range or other cabinet structure on which the same may be used.

Briefly stated, my invention contemplates the provision in connection with a panel structure of an adjustable device capable of exerting force in the direction opposite to that of the warp sufficient in amount to counterbalance and overcome the distortion and return the panel to straightened form. This function is accomplished in the present disclosure by means of a U-shaped warp compensator member or assembly, the transverse portion of which extends substantially along one edge of the panel and the

parallel end portions of which extend a distance along those panel edges that extend from the ends of the first-mentioned edge, screw adjustment means being provided for twisting the opposite ends of the transverse portion relative to one another so as to adjust the parallel end portions to the desired angularity relative to one another and accordingly offset the inherent twist in the panel by the equal and opposite twist of the warp compensator assembly, so as to straighten the panel.

In the drawings which form a part of this specification—

Fig. 1 is a fragmentary perspective view of a range showing a cooking top cover or lid incorporating my invention, the lid being shown raised;

Fig. 2 is a view similar to Fig. 1, but showing the lid closed, and indicating in dotted lines an assumed position of the lid prior to the adjustment of the warp compensator which straightens it to the full line position;

Fig. 3 is an enlarged fragmentary front elevation of the hinged end of the lid shown in Fig. 1;

Fig. 4 is a rear elevation of Fig. 3;

Fig. 5 is an enlarged horizontal sectional detail taken on the line 5-5 of Fig. 3;

Fig. 6 is an enlarged vertical sectional detail taken on the line 6-6 of Fig. 3;

Figs. 7, 8, and 9 are enlarged vertical sectional details taken on the lines 7-7, 8-8, and 9-9 of Fig. 3;

Fig. 10 is a perspective view of a range showing another cooking top cover or lid incorporating a modified form of my invention, the lid that is shown closed having a dotted line position showing an assumed position prior to the adjustment of the warp compensator;

Fig. 11 is an enlarged fragmentary front elevation of the hinged end of the left-hand lid of Fig. 10, with a section of the inner panel of the lid broken away to show the hinge member with the built-in warp eliminator;

Fig. 12 is an enlarged plan view of a portion of Fig. 11 taken on the line 12-12;

Figs. 13 and 14 are enlarged vertical sectional details taken on the lines 13-13 and 14-14 of Fig. 11;

Fig. 15 is a view similar to Fig. 11, showing still another cooking top lid incorporating another embodiment of my invention, a section of the inner panel being broken away to disclose the warp compensator;

Fig. 16 is an enlarged horizontal sectional detail taken on line 16-16 of Fig. 15;

Fig. 17 is an enlarged vertical sectional detail taken on the line 17—17 of Fig. 15;

Fig. 18 is another view similar to Figs. 11 and 15, showing still another cooking top lid incorporating another embodiment of my invention, a section of the inner panel being broken away to disclose the warp compensator;

Fig. 19 is a plan view of a portion of Fig. 18 taken on the line 19—19, and

Fig. 20 is an enlarged vertical sectional detail taken on the line 20—20 of Fig. 18.

The same reference numerals are applied to corresponding parts in all related views.

In panel constructions of the general type illustrated in Fig. 1, that is, those intended for doors and lids for kitchen ranges and the like, it has previously been proposed to supply a substantially U-shaped frame member on each such hinged panel, extending the full width thereof, to serve not only as a reinforcement but also as a hinge member, for hingedly mounting the same. The U-member is normally so disposed that the web or transverse portion extends along the hinged edge of the panel and so that the parallel end portions extend along at least a portion of those edges of the panel extending from the ends of the first-mentioned edge. Such a construction is disclosed in the copending application of Stanley H. Hobson, Serial No. 256,655, filed February 16, 1939. I prefer to incorporate the warp compensator of my invention in a similar U-member.

Viewing specifically Figs. 1-9, inclusive, the lid 21 is shown as of a single panel construction having peripheral flanges 22 which serve to add rigidity to the structure. This panel preferably has rubber bumper pads 21' at the front corners to engage the cooking top when the lid is closed. Single panel lids of this type are frequently employed in stoves of less expensive construction. The U-shaped hinge member 23 with which my invention is especially concerned is secured in the panel partly by means of two small screws 24 entered through the rear flange 22 into holes in the transverse web portion 25 of the U-member, and partly by the engagement of the end portions 26 of the U-member 23 under small tabs 27 which are formed integral with the side flanges 22. A middle portion of the rear flange 22 is cut away as indicated at 28 and the U-member has an elongated knuckle portion 29 projecting through this opening. Pintles 30 extending through a pair of knuckles 31 provided on a hinge member 32 fastened as at 33 to the cooking top 34, serve to pivotally attach the lid to the range and are received in holes 35 drilled into opposite ends of the knuckle 29. The holes 35 are counterbored as at 36 to receive the coiled torsion springs 37 which fit on the pintles 30, as shown, and have one end 38 fixed by engagement with the hinge member 32 and the other end 39 rotatable with the lid by engagement in a longitudinal slot 40 in the end of the knuckle 29 communicating with the bottom of the counterbore 36. The two springs 37 at opposite ends of knuckle 29 tend normally to urge the lid upwardly and hence hold the lid against accidentally dropping when in raised position. The lid's movement in raising is limited by the engagement of lips 41 on the opposite ends of the knuckle 29 with the back edge 42 of the hinge member 32, as shown in Figs. 4 and 9, whereby to hold the lid in a substantially vertical position and prevent contact with the upright back rail 43 of the range.

While I have spoken of the U-member 23 as a

"hinge member" its functions in accordance with the present invention are not limited to those of a hinge. The U-member 23 has two sets of slots cut therein near the opposite ends of the knuckle 29 so as to make the left and right hand end portions 44 and 45, respectively, more or less free to be flexed in relation to the middle portion 46, each set of slots consisting of two parallel slots 47 and 48, one from the front and the other from the rear, both reaching only part way up from the bottom edge so that a connecting bridge portion 49 is left thereabove. This portion 49 is what assumes the brunt of the twisting stress, as will soon appear. There is another slot 50 in transverse relation to and between the slots 47 and 48 cored through the knuckle in a diametrical plane upwardly from the bottom of the knuckle to the tops of the slots 47 and 48 ending below the connecting bridge portion 49, as appears in Figs. 3, 4 and 9, so that the screw 51 entered in a tapped hole 52 provided in the knuckle 29 below the slot 50 and working between the slots 47 and 48 to set up a torsional stress in portion 49, will be free to function when tightened to twist the portion 44, or 45, as the case may be, with relation to the middle portion 46 about the longitudinal axis of the knuckle 29 to correct a given warpage in the panel, the knuckle 29 being free to twist in the portion 49 to the extent necessary, without fracture, even though ordinary castings are used. Thus, in the event the left-hand edge of the lid 21 is too low and consequently prevents the right-hand edge from coming into contact with the top of the range when the lid is lowered, as indicated in dotted lines in Fig. 2, that may be remedied by tightening the left-hand screw 51. The effect of this operation is to force inward or downward the end portion 44 of the hinge member 23 so that the left arm 26 of the U-member 23 becomes angularly offset relative to the right arm 26, enough to straighten the panel and make it lie flat, assuming the screw 51 is adjusted far enough. Obviously, if the right side of the lid is too low, compensating adjustment is made with the right-hand screw 51. Not infrequently after one of the screws 51 has been tightened to effect a compensation it is found that that side is now too high; in that event, adjustment may often be secured by backing up the same screw somewhat inasmuch as there is sufficient "spring" present in the strained or twisted section of the member 23 to return it substantially to its original position when the distorting force is removed. Otherwise, slight tightening of the other screw 51 will give an offsetting twist in the member 23 so as to straighten the lid.

I have described in detail the structure shown in Figs. 1-9. However, the desired results may be effected by various related but different constructions, as shown in Figs. 10-20.

The modification illustrated in Figs. 10-14 is shown incorporated in a cooking top lid 21a comprising an outer panel 53 and an inner panel 54. The U-shaped member 23a is anchored to the inner panel 54 by means of the bolts 55, the outer panel 53 being fastened to the inner panel in any suitable way, as by screws 56. In this instance the compensating twist occurs largely in the middle section 57 of the web 25a of the U-shaped member 23a. The twisting force is applied by screws 51a threaded into the ends of an inner relatively large middle flange 58 formed on the web 25a. The screws 15 bear against the adjacent ends of other end flanges 59 and 60. The web 25a is ribbed longitudinally and transversely

as indicated at 61 for reinforcement of flange portion 58 so as to avoid appreciable deflection thereof in adjustments of screws 51a. The flanges 59 and 60 are certain to cause twisting of the web 25a in regions 62 because of the slots 63 in the web 25a separating the ends of the middle flange 58 from the adjacent ends of flanges 59 and 60. The arms 26a of U-member 23a accordingly may be twisted to the desired angularity relative to one another similarly as in the construction previously described, whereby to correct for warpage of the panels 53 and 54, which may cause the lid 21a to be twisted, as indicated in dotted lines on the right-hand portion of Fig. 10. Openings 64 are provided in the inner panel 54 to enable adjustment of the screws 51a in the assembled lid. The hinges 65 with counterbalancing spring mechanisms 66 correspond closely to what is disclosed in the Hobson application mentioned above.

In the further modified form shown in Figs. 15-17 the lid 21b has a U-shaped hinge member 23b made of two substantially L-shaped members 67 and 68 which overlap at 67a-68a, at approximately the mid-section of the U. In the assembled lid these L-shaped members 67 and 68 are anchored to the inner panel 54 by means of the screws 55. On the L-shaped member 68 are the coaxial bearings 69 and 70 and on the L-shaped member 67 are the coaxial bearings 71 and 72. The two L-shaped members 67 and 68 are assembled together with a pintle 73 extending through all of the bearings 69-72. A screw 74 passes freely through a hole 75 in the end 68a of member 68 and threads in hole 76 in the end 67a of member 67. Another screw 77 threaded in a hole 78 in the end 68a of member 68 is arranged to bear against the adjacent end 67a of member 67. Openings 79 in panel 54 permit adjustment of the screws 74 and 77. Distortion in the lid is rectified by causing the screws 74 and 77 to rotate the L members 67 and 68 about the pintle 73 in opposite directions until they reach points where the distortion in the lid is eliminated. The adjustment of screw 74 determines the angle between the arms 26b obtained when the screw 77 is tightened; the angle may be increased by loosening screw 74 and then tightening screw 77, or it may be reduced first by loosening screw 77, then tightening screw 74 a turn or so and then retightening screw 77.

In the further modified form of my invention shown in Figs. 18, 19 and 20, the lid 21c employs a U-shaped hinge member 23c comprised of two L-shaped members 80 and 81, and here again the ends 80a and 81a overlap. A V-shaped fulcrum 82 is provided on the end 81a and a V-shaped recess 83 capable of receiving said fulcrum is provided on the end 80a. Preferably, that face of the end 80a which has the recess 83 is beveled away from the recessed middle portion in both directions as at 84. Such construction permits a wider range of adjustment for a given height fulcrum projection 82. Screws 85 passing through holes 86, one on each side of the recess 83 in the end 80a, thread in holes 87 in the end 81a on each side of the fulcrum 82. A ridge 88 on the rear face of the end 81a serves to space the same from the outer panel 53 permitting protrusion of the ends of the screws 85. Warp in the lid is corrected by proper adjustment of the screws 85.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims

have been drawn with a view to covering all legitimate modifications and adaptations.

I claim:

1. In a hinge structure, a single elongated hinge member adapted to be applied to the hinging edge of an element that is to be hingedly mounted, and a plurality of other hinge members pivotally connected at longitudinally spaced points with the first mentioned hinge member in substantially coaxial relationship to one another, and means for subjecting the first mentioned hinge member to a twisting action substantially about its longitudinal axis so as to offset the ends to a desired angularity with respect to one another.

2. In a hinge structure, a single elongated U-shaped hinge member adapted to be applied to the hinging edge of an element that is to be hingedly mounted, and a plurality of other hinge members pivotally connected at longitudinally spaced points with the transverse portion of the first mentioned hinge member in substantially coaxial relationship to one another, and means for subjecting the transverse portion of the first mentioned hinge member to a twisting action substantially about its longitudinal axis so as to offset the ends to a desired angularity with respect to one another.

3. In a hinge structure, the combination of a pair of elongated hinge members adapted to be attached in endwise alignment to the hinging edge of an element that is to be hingedly mounted, other hinge members pivotally connected to the first mentioned hinge members in substantially coaxial relation to one another, means pivotally connecting said first mentioned hinge members for relative rotary displacement thereof about their longitudinal axes, and means for fixedly angularly displacing said first mentioned hinge members about said pivot means.

4. In a hinge structure, the combination of a pair of L-shaped hinge members adapted to be attached to the hinging edge of an element that is to be hingedly mounted, said members being disposed with their transverse portions in endwise alignment to define a U, other hinge members pivotally connected to said portions in coaxial relationship, means pivotally connecting said portions for relative rotary displacement thereof about their longitudinal axes, and means for fixedly angularly displacing said first mentioned hinge members about said pivot means.

5. In a hinge structure, the combination of a pair of elongated hinge members adapted to be attached in endwise alignment to the hinging edge of an element that is to be hingedly mounted, other hinge members pivotally connected to the first mentioned hinge members in substantially coaxial relation to one another, the ends of said first mentioned hinge members being in overlapping relation, means for tiltably supporting one of said ends on the other for tilting adjustment of said hinge members about their longitudinal axes, and means for adjustably securing said ends in a desired tilted relationship.

6. In a hinge structure, the combination of a pair of L-shaped hinge members adapted to be attached to the hinging edge of an element that is to be hingedly mounted, said members being disposed with their transverse portions in endwise alignment to define a U, other hinge members pivotally connected to said portions in coaxial relationship, the ends of said first mentioned hinge members being in overlapping relation, means for tiltably supporting one of said

ends on the other for tilting adjustment of said hinge members about their longitudinal axes, and means for adjustably securing said ends in a desired tilted relationship.

7. An adjustable hinge structure comprising a single elongated hinge member adapted to be applied to the hinging edge of an element that is to be hingedly mounted, and a plurality of other hinge elements pivotally connected thereto at longitudinally spaced points in substantially coaxial relation to one another, said first mentioned hinge member being split part way through from one edge thereof in longitudinally spaced relation to both ends so as to provide overlapping relatively flexible portions extending longitudinally with respect to said hinge member, and adjustable screw threaded means on each of said split portions either of which when adjusted being arranged to cause a torsional adjustment of the related end portion of said hinge member.

8. A hinge structure as set forth in claim 7, wherein said first mentioned hinge member is generally U-shaped and provides substantially parallel arms both extending in the same direction from the end portions of said hinge member, said arms being elongated so that a given torsional adjustment of either end portion of the hinge member results in a multiplied adjustment of the free end of the related arm substantially as and for the purpose described.

9. In an adjustable hinge structure, the combination of a pair of elongated hinge members adapted to be applied in endwise alignment to the hinging edge of an element that is to be hingedly mounted, other hinge members pivotally connected to the first mentioned hinge members in substantially coaxial relation to one another, the end portions of said elongated hinge members extending in overlapping spaced substantially parallel relation, an elongated pintle disposed in substantially parallel relation to said hinge members adjacent the overlapping end portions and received in coaxially aligned bearings provided therefor on said end portions, and adjustable screw threaded means interconnecting said overlapping end portions in radially spaced relation with respect to the pintle so as to permit pivotally adjusting said first mentioned hinge members with respect to one another.

10. A hinge structure as set forth in claim 9, wherein the first mentioned hinge members are both substantially L-shaped so that when assembled in the relationship described they form a U, the arms of which both extend in the same direction with respect to the pivotally connected portions of said hinge members, said arms being elongated whereby a given pivotal adjustment of said hinge members by the screw threaded means results in a multiplied adjustment of the outer ends of said arms substantially as and for the purpose described.

11. In an adjustable hinge structure, the combination of a pair of elongated hinge members adapted to be applied in endwise alignment to the hinging edge of an element that is to be hingedly mounted, other hinge members pivotally connected to the first mentioned hinge members in substantially coaxial relation to one another, the end portions of said elongated hinge members extending in overlapping spaced substantially parallel relation, a longitudinally extending fulcrum projection on one of said end portions engaging a longitudinally extending fulcrum recess provided in the other end portion whereby said first mentioned hinge members are

tiltably adjustable with respect to one another, and adjustable screw threaded means interconnecting said end portions in spaced relation on opposite sides of said fulcrum and arranged when adjusted to change the angular relationship of said end portions relative to one another and accordingly change the angular relationship of said first mentioned hinge members relative to one another.

12. A hinge structure as set forth in claim 11, wherein the first mentioned hinge members are both substantially L-shaped so that when assembled in the relationship described they form a U, the arms of which both extend in the same direction with respect to the tiltably engaging portions of said hinge members, said arms being elongated whereby a given pivotal adjustment of said hinge members by the screw threaded means results in a multiplied adjustment of the outer ends of said arms substantially as and for the purpose described.

13. In combination, a hollow panel adapted to be hingedly mounted and comprising spaced inner and outer flexible panel members suitably interconnected, and an adjustable hinge structure for said panel comprising hinge members adapted to be attached to a support in spaced coaxial relation to one another, and adjustable hinge means within the panel between the inner and outer panel members at the hinging edge portion of the panel and pivotally connected to the aforesaid hinge members through openings provided therefor in the hinging edge portion of the panel, said hinge means comprising portions relatively adjustable with respect to one another about an axis extending longitudinally of the hinging edge portion of the panel, and adjustable screw threaded means for effecting such adjustment, said screw threaded means being accessible through an opening provided in one of said panel members.

14. In combination, a hollow sheet metal panel comprising inner and outer panel members suitably secured together, and warp compensating means between and in rigid relation thereto the panel members comprising screw threaded means for operating the same, operative from the outside of the panel through an opening provided in one of said panel members to counteract and substantially neutralize twisting distortion in said panel due to warpage of either one or both of said panel members whereby to straighten the panel.

15. In a counterbalanced hinge structure the combination of an elongated attaching plate having thereon longitudinally spaced knuckle projections, an elongated hinge member having an elongated knuckle portion disposed between said projections, pintles projecting through coaxially aligned holes provided in said knuckle projections and received in coaxially aligned holes provided in the opposite ends of said elongated knuckle portion, and at least one coiled torsion spring encircling one of said pintles and housed in an enlarged counterbore provided in one of said last named pintle receiving holes in the elongated knuckle portion, said spring having outwardly projecting ends one of which is outside the elongated knuckle portion and engages one longitudinal edge of the attaching plate and the other of which is at the inner end of the counterbore and engages a recess provided therefor therein, said elongated knuckle portion also having a projection arranged to engage the other longitudinal edge of the attaching plate when

the elongated hinge member reaches a limit position with respect to the attaching plate.

16. The method of straightening a hollow sheet metal panel made up of two spaced flexible panel members, enameled on at least the outer surfaces thereof and subjected to slight twisting distortion as a result of heat treatment during enameling, which method consists in suitably interconnecting said panel members in assembled relationship to form a unitary hollow panel, the twisting distortion of each panel member con-

tributing toward a resultant twisting distortion of the hollow panel, placing between the panel members prior to their interconnection an undistorted frame member in rigid relationship to the panel members but accessible from the outside thereof for adjustment to distorted condition, and finally giving said frame member a counteracting distortion in a direction and to a degree sufficient to straighten the panel.

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