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TORSION BAR HINGE STRUCTURE

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2 Sheets-Sheet 1

FIG.1

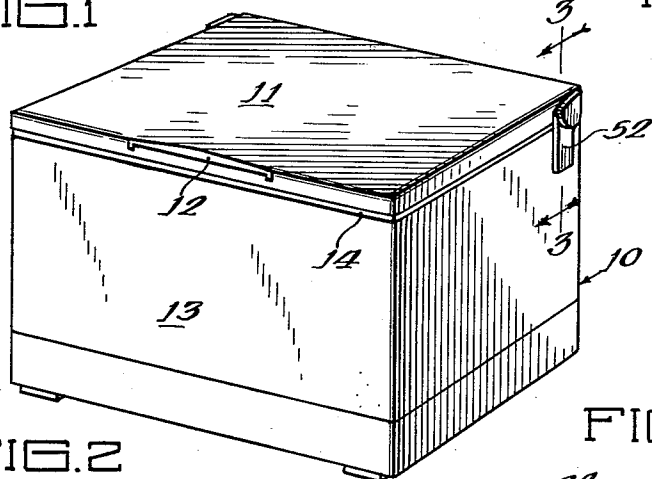


FIG. 2

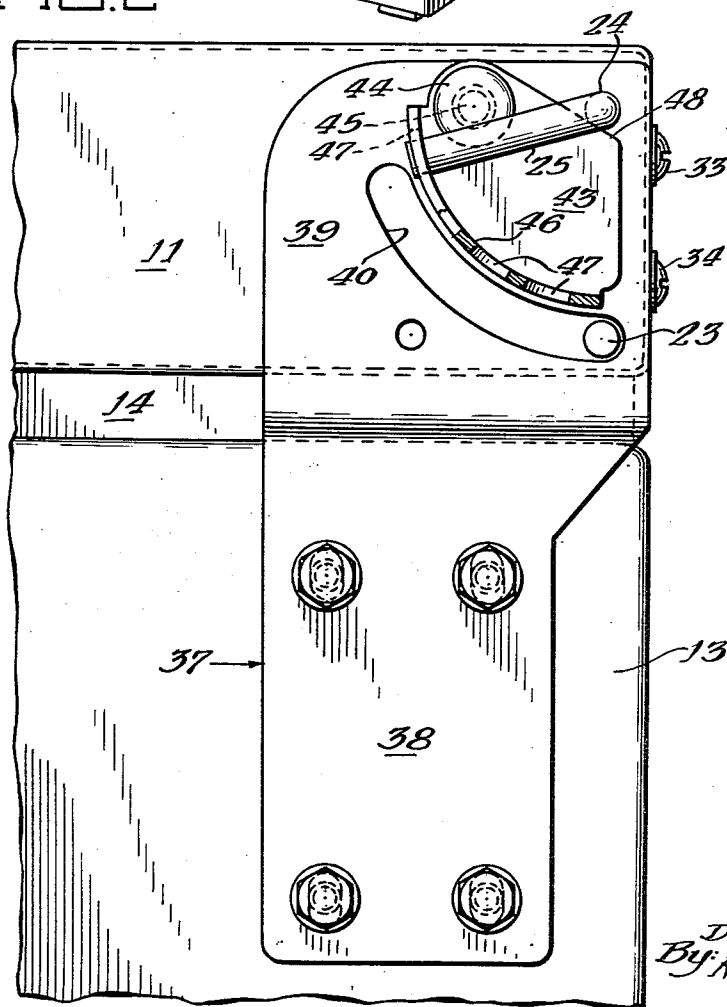


FIG. 4

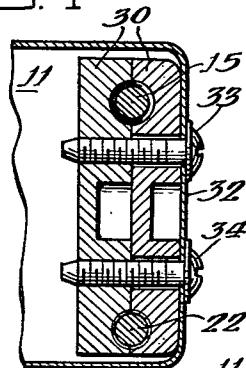
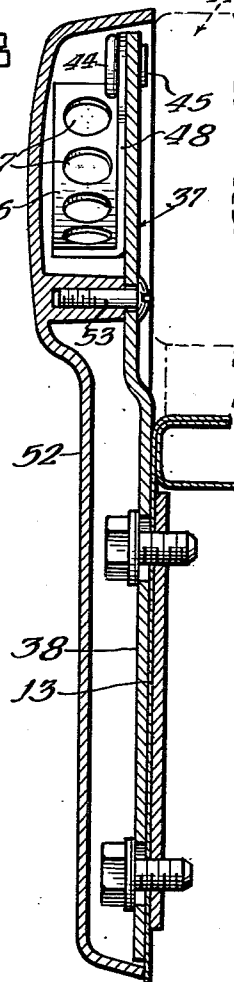


FIG. 3



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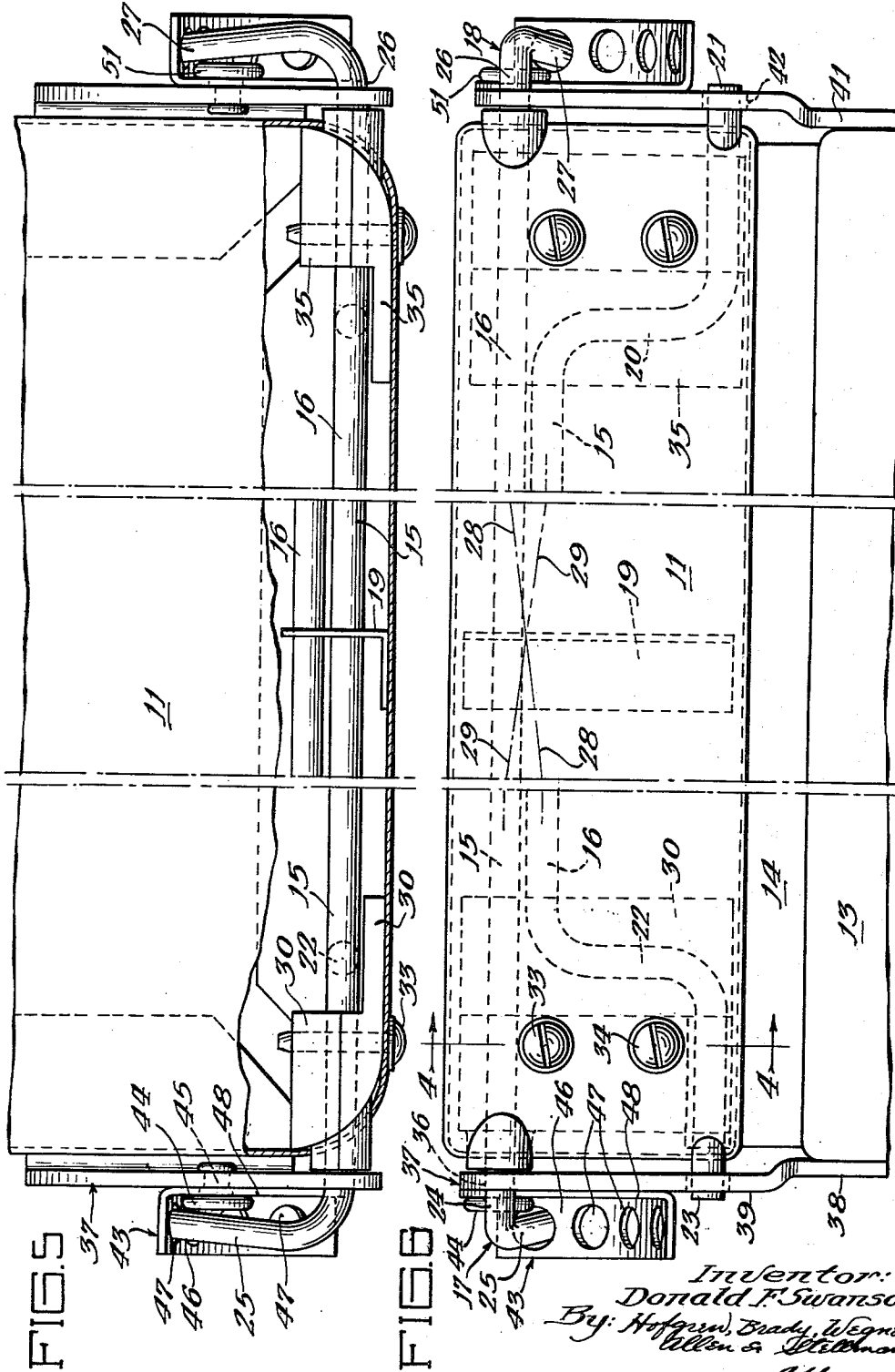
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TORSION BAR HINGE STRUCTURE

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TORSION BAR HINGE STRUCTURE

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6 Claims. (Cl. 16—180)

This invention relates to a hinge structure for pivotally mounting a closure member such as a door on a pair of hinge members on opposite sides of the closure member for movement about a pivotal axis.

The invention here is particularly concerned with pivotally mounting a closure member such as a door and particularly a lid on a box such as a freezer in which a pair of torsion bars are provided under torsional stress tending to urge the closure member toward open position but being insufficient to move the closure member when this member is closed. The torsion bars each have an end extending from the closure member and including a hinge portion engaging a hinge member for supporting the closure member thereon. The second portion of each torsion bar is spaced from the hinge portion and is attached to the closure member for exerting the torsion force on the closure member.

One of the features of this invention is to provide a hinge structure of the above type in which a pair of torsion bars are provided, each having a hinge portion engaging a hinge member for supporting the closure member thereon and a second portion spaced from the hinge portion and attached to the closure member.

Another feature of the invention is to provide a hinge structure having improved means for adjustably attaching the outer end of each torsion bar to a hinge member.

A further feature of the invention is to provide an improved hinge structure in which the torsion bars are prestressed and the stress of each tends to hold the outer end of the bar in engagement with its hinge member but which when the outer end is moved against the stress the engagement is easily released.

Other features and advantages of the invention will be apparent from the following description of one embodiment thereof as shown in the accompanying drawings. Of the drawings:

FIGURE 1 is a perspective view of a freezer having a hinge structure embodying the invention.

FIGURE 2 is a fragmentary enlarged side elevational view of the hinge structure with the hinge cover removed.

FIGURE 3 is an enlarged sectional elevational view taken substantially along line 3—3 of FIGURE 1.

FIGURE 4 is a sectional elevational view taken substantially along line 4—4 of FIGURE 6.

FIGURE 5 is a fragmentary plan view of the rear of the embodiment, partially broken away for clarity of illustration and with the hinge cover removed.

FIGURE 6 is a rear elevational view of the portion of the embodiment shown in FIGURE 5.

In the illustrated embodiment the hinge structure is illustrated in conjunction with a chest freezer 10 having a top lid 11 which is provided with a front handle 12. Between the box 13 of the freezer and the lid 11 there is provided a gasket 14 which is preferably of the well known magnetic type.

Positioned within the closure member or lid 11 at the back thereof are a pair of torsion bars 15 and 16. Each torsion bar has one end 17 and 18 extending from the lid. The end 17 is a part of the torsion bar 15 while the end 18 is a part of the torsion bar 16. As is illustrated in FIGURES 5 and 6, the two torsion bars are closely adjacent each other and are twisted so that at the left end of the lid, as viewed in FIGURE 6, torsion bar 15 is above bar 16 while at the right end of the lid bar 16 is above bar 15. In the area adjacent the center of the lid the bars

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are arranged side by side, as illustrated in FIGURE 5, and are retained loosely in openings (not shown) in a bracket 19 attached to the rear surface of the lid 11.

One end of the torsion bar 15 is formed as a right angled crank 20 or first attaching portion which includes an end portion 21 extending outwardly from the lid 11 in the area adjacent the bottom of the lid. The other torsion bar 16 has its end that is opposite the crank 20 shaped to a similar right angled crank 22 or first attaching portion having an end portion 23 extending outwardly from the lid 11 adjacent the bottom thereof. The end portions 21 and 23 are substantially aligned.

The one end 17 of the torsion bar 15 includes a hinge portion 24 and an end portion 25 or second attaching portion arranged at an angle thereto. In the illustrated embodiment this angle is slightly less than 90°. The one end 18 of the other torsion bar 16 is similarly provided with a hinge portion 26 and an end portion 27 or second attaching portion. The hinge portions 24 and 26 are aligned and the intermediate portions between the hinge portions 24 and 26 and the cranks or second portions 20 and 22 are loosely held in the lid 11 so as to be capable of twisting relative to the lid. These intermediate portions of the torsion bars are indicated schematically at the center of FIGURE 6 by the foreshortened lines 28 and 29. Line 28 represents the intermediate portion of torsion bar 16 while line 29 represents the intermediate portion of torsion bar 15.

The crank end of torsion bar 16 is clamped between a pair of bearing plates 30 which are held clamped together against the rear 32 of the lid 11 by means of a pair of clamping screws 33 and 34. As can be noted in FIGURE 4, the end of crank 22 of the torsion bar 16 is loosely held between these bearing plates. The other torsion bar 15 is also loosely held between these plates. The plates 30 operate to retain the crank end of torsion rod 22 and also serve as a torque bearing or guide blocks for the other torsion bar 15. The crank 20 of the torsion bar 15 is also provided with similar bearing plates 35.

The hinge portion 24 of the bar 15 is held within an opening 36 in an end hinge member 37. This hinge member is in the form of a metal plate, as shown in FIGURE 2, having a bottom portion 38 bolted to the box 13 of the freezer and an upper portion 39 adjacent an end of the lid 11 and spaced a short distance therefrom and substantially parallel thereto. The projecting end 23 of the torsion bar 16 extends into an arcuate slot 40 in this upper portion with the center of radius of slot 40 substantially coinciding with the pivotal axis as determined by the hinge portion 24. Thus the engagement of the end portion 23 with the hinge member 37 at each end of the slot 40 determines the arcuate path of movement of the lid 11. The opposite end of the freezer is provided with a similar hinge member 41 also provided with a slot 42 similar to the slot 40 and into which the end portion 21 of the torsion bar 15 extends.

Attached to the hinge member 37 is a bracket 43. This bracket is adjacent the end portion 25 of the torsion bar 15 and is mounted for arcuate movement relative to the hinge member. This arcuate movement is achieved by mounting the bracket 43 on a rivet 44 adjacent the top edge of the bracket and about which the bracket is movable. As is shown in FIGURE 2, the pivotal axis 45 as determined by the center of the rivet 44 is above the end portion 25 and the stressed condition of the torsion bar 15 tends to urge this end portion 25 away from the rivet 44.

The bracket 43 is provided with an arcuate flange 46 adjacent its lower edge and adjacent and above the arcuate slot 40. When the bracket 43 is in the position shown in FIGURE 2 the center of radius of the bracket 46 substantially coincides with the center of radius of

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the slot 40 so that they both substantially coincide with the pivotal axis of the lid as determined by the central axis of the hinge portion 24 of the bar 15. The outer end of the hinge portion 25 is adapted to be arranged in a selected one of a plurality of holes 47 in the flange 46 with the holes arranged from end to end of the flange. In the illustrated embodiment the end portion 25 is held in the hole 47 that is at the rivet end of the flange.

The edge 48 of the bracket 43 adjacent the hinge portion 24 ordinarily bears against this hinge portion as indicated at FIGURE 2 so that the edge 48 constitutes a stop. Because the movement axis 45 of the bracket 43 is above the end portion 25 or on the side away from the direction which the end portion 25 tends to move under the prestressed condition of the rod 15, the pressure of this end portion 25 applied within its hole 47 to the flange 46 holds the edge 48 against the hinge portion 24. Although bracket 43 may be easily withdrawn from engagement with the end portion 25, this is not ordinarily done as the stresses in the torsion bars are set at the factory and are determined by the particular hole 47 that the end portion 25 engages. In the illustrated embodiment the torsion bars are set at maximum stress as the end portions 25 and 27 engage end holes.

In engaging the end portion 25, for example, in a hole 47 it is only necessary to move the end portion 25 to a position adjacent the bracket axis 45 and then to turn the bracket 43 in a counterclockwise direction, as viewed in FIGURE 2, to insert the end of the end portion 25 in its hole 47. Pressure of the end portion 25 on the flange 46 will force the stop portion 48 of the bracket against the hinge portion 24 and the end portion 25 will thus be locked in position.

The hinge member 41 for the torsion bar 16 is provided with a similar bracket 49, flange 50 and rivet 51 construction arranged and operating in the same manner with respect to the end portion 27 of the torsion bar 16.

Each of the hinge members is provided with a cover plate, as illustrated at 52, that covers its hinge members 37 or 41, bracket 43 or 49 and torsion bar end portion 25 or 27. Each cover plate is held in position by means of a screw 53.

The torsion bars 15 and 16 are prestressed so as to urge the lid 11 toward an open position. This prestressed condition when the lid is closed is not sufficient to open the lid. However, when the lid is opened by means of the handle 12 the urging of the torsion bars tends to aid in the opening so that less effort is required. Furthermore, in the preferred installation as the lid is opened it reaches a point intermediate between fully closed and fully open positions where the torsion bars tend to hold the lid partially open. Thus, in one embodiment where the lid was without torsion bars and closed, an initial force of 610 inch pounds was required to initiate opening of the lid. As the opening was continued to a point where the lid extended upwardly an angle of 70° from the horizontal the force required was only 225 inch pounds. The torsion bars used with this lid exerted an opening force of about 550 inch pounds when the lid was closed and an opening force of 325 inch pounds when the lid was fully open to the 70° angle. This force in the torsion bars was sufficient to exactly counterbalance the lid when the lid was opened to an angle of approximately 54°.

As can be seen from the above description of the invention, the hinge structure is quite simple and requires only a very small number of parts. Furthermore, the torsion bars not only aid in reducing the force required to open the closure member or lid but also serve as pivotal members for pivoting the closure member on the hinge members. The structure of this invention also permits locating all of the external parts of the hinge structure on the ends of the freezer 10 or other box construction so that no part projects at the top or the rear. This makes it much easier to move the freezer or similar article in and out of narrow doorways as there are no

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projecting parts to catch on the door jams. In addition, the structure of this invention permits pivoting the lid adjacent its top so that the freezer or the like can be placed very close to a wall without interfering with the movement of the lid. Another very important advantage of the invention is the locking arrangement for locking the extended ends of the torsion bars so that the stress in the bars aids in locking them in place.

Having described my invention as related to the embodiment shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

The embodiment of the invention in which an exclusive property or privilege is claimed is defined as follows.

I claim:

1. A hinge structure for pivotally mounting a closure member on a pair of hinge members on opposite sides of the closure member for movement about a pivotal axis, comprising: a pair of torsion bars each including a hinge portion engaging a hinge member for supporting the closure member thereon, a second portion spaced from said hinge portion and an end portion outwardly of said hinge portion and at an angle to said hinge portion; means fixedly securing each of said second portions to said closure member; and a bracket attached to each of said hinge members for arcuate movement about an axis and having a stop portion and a flange portion containing an opening into which one of said end portions extends for fixedly securing each of said hinge portions to a hinge member, said torsion bars being stressed to urge said closure member toward an open position against the weight of the closure member and said stress urging each of said bracket stop portions into engagement with one of said torsion bars, each bar having a section between said hinge portion and second portion adjacent said axis and movable relative to the closure member when subjected to torque.

2. A hinge structure for pivotally mounting a closure member on a pair of hinge members on opposite sides of the closure member for movement about a pivotal axis, comprising: a pair of torsion bars each including a hinge portion engaging a hinge member for supporting the closure member thereon, a second portion spaced from said hinge portion and an end portion outwardly of said hinge portion and at an angle to said hinge portion; means fixedly securing each of said second portions to said closure member; and a bracket attached to each of said hinge members for arcuate movement about an axis and having a stop portion and a flange portion curved about an arc whose center of radius substantially coincides with said pivotal axis, said flange portion containing a plurality of openings into one of which one of said end portions extends for fixedly securing said hinge portion to said hinge member, said torsion bars being stressed to urge said closure member toward an open position against the weight of the closure member and said stress urging each of said bracket stop portions into engagement with one of said torsion bars, each bar having a section between said hinge portion and second portion adjacent said axis and movable relative to the closure member when subjected to torque.

3. A hinge structure for pivotally mounting a closure member on a pair of hinge members on opposite sides of the closure member for movement about a pivotal axis, comprising: a pair of torsion bars each including a hinge portion engaging a hinge member for supporting the closure member thereon, a second portion spaced from said hinge portion and an end portion outwardly of said hinge portion and at an angle to said hinge portion; means fixedly securing each of said second portions to said closure member; and a bracket attached to each of said hinge members for arcuate movement about an axis and having a stop portion and a flange portion curved about an arc whose center of radius substantially

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coincides with said pivotal axis, said flange portion containing a plurality of openings into one of which one of said end portions extends for fixedly securing said hinge portion to said hinge member, said torsion bars being stressed to urge said closure member toward an open position against the weight of the closure member, said stress tending to urge said end portion in one direction and said bracket axis being spaced from said end portion on the side thereof opposite to said one direction and said stress urging each of said bracket stop portions into engagement with one of said torsion bars, each bar having a section between said hinge portion and second end portion adjacent said axis and movable relative to the closure member when subjected to torque.

4. A hinge structure for pivotally mounting a closure member having lateral sides, opposite ends and a bottom for movement generally upwardly from a closed position, comprising: a pair of hinge members adjacent said ends within the confines of said lateral sides and having top portions extending upwardly above said bottom; a pair of torsion bars within said closure member each including a hinge portion projecting from an end of said closure member located above said bottom thereof and an attaching portion within the closure member spaced from said hinge portion, each said hinge portion engaging a hinge member top portion above said closure member bottom for suspending said closure member from said top portion during said upward movement; and means fixedly securing each of said attaching portions within said closure member.

5. A hinge structure for pivotally mounting a closure

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member having lateral sides, opposite ends and a bottom for movement generally upwardly from a closed position, comprising: a pair of hinge members adjacent said ends within the confines of said lateral sides and having top portions extending upwardly above said bottom; a pair of torsion bars within said closure member each including a hinge portion projecting from an end of said closure member located above said bottom thereof, a first attaching portion within the closure member spaced from said hinge portion and a second attaching portion outwardly of said hinge portion, each said bar being torsionally stressed between said first and second attaching portions and each said hinge portion engaging a hinge member with said second attaching portion located outwardly of said hinge portion; means fixedly securing each of said first attaching portions within said closure member; and a bracket attached to and carried by each of said hinge members and engaged by one of said second attaching portions for fixedly securing each of said second attaching portions to a hinge member.

6. The hinge structure of claim 5 wherein each said bracket is pivotally mounted on said hinge member and held against pivotal movement due to said stress by engagement with its corresponding torsion bar.

References Cited in the file of this patent

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