June 11, 1957 T. P. FOLEY 2,795,015

ADJUSTABLE DOOR BRACE CONSTRUCTION

Filed April 28, 1955

FIG. 1

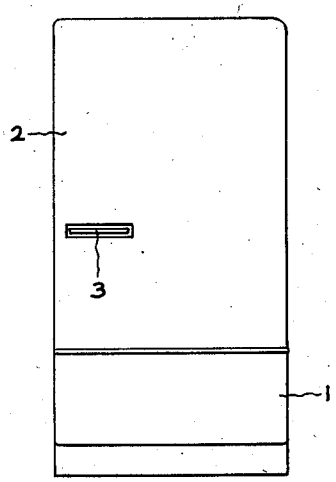


FIG. 2

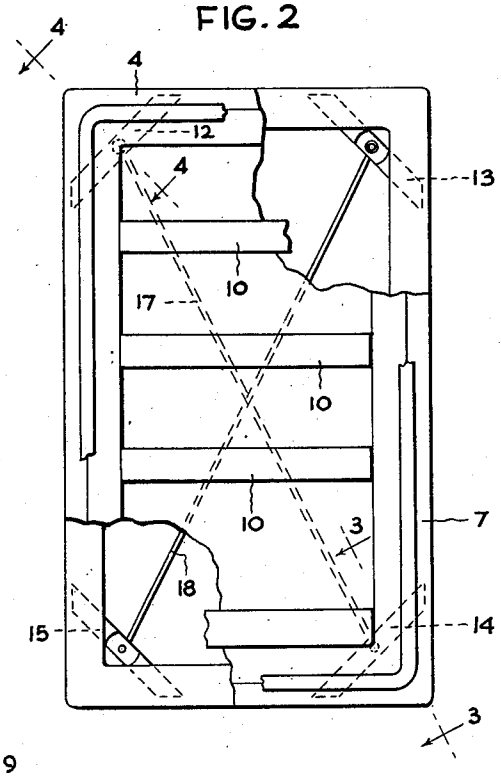


FIG. 3

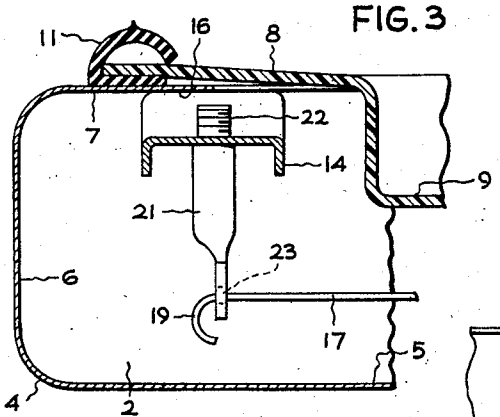


FIG. 4

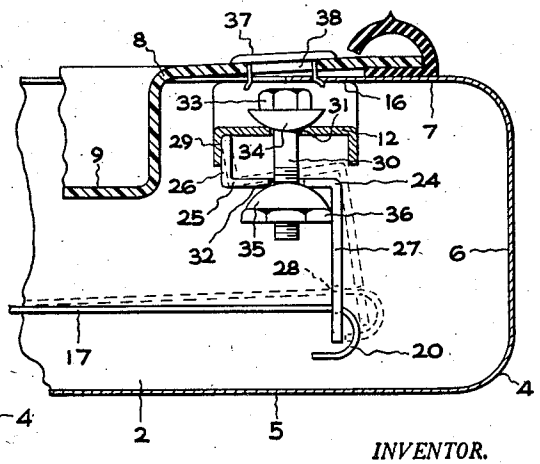
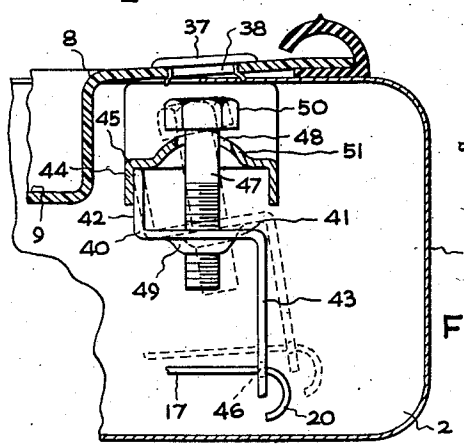


FIG. 5



INVENTOR.
THOMAS P. FOLEY

BY Walter E. Rule

HIS ATTORNEY

United States Patent Office 2,795,015 Patented June 11, 1957

2,795,015

ADJUSTABLE DOOR BRACE CONSTRUCTION

Thomas P. Foley, Louisville, Ky., assignor to General Electric Company, a corporation of New York

Application April 28, 1955, Serial No. 504,514
5 Claims. (Cl. 20—38)

My invention relates to braces for heavy doors, such as refrigerator doors, and more particularly to an adjustable door brace construction for permitting adjustment to alter the shape of the door.

In the building of refrigerator cabinets and the like on a mass production basis the plane of the door in the completed cabinet is sometimes not entirely parallel to the plane of the face of the cabinet. Such a condition may prevent the proper sealing of the door. Provision may be made by the use of adjustable diagonal cross braces for varying the plane of the door to bring it into coincidence with the plane of the face of the cabinet. But when a door liner having a deep recess for the accommodation of door shelves is included in the door structure, difficulties have been encountered in providing a suitable bracing arrangement of this sort. The braces must be set back a considerable distance from the inner face of the door to allow clearance for the liner recess, but yet they must be readily adjustable after the liner has been mounted in place.

Therefore, it is an object of my invention to provide a new and improved adjustable door brace construction for refrigerator doors.

It is another object of my invention to provide a simplified adjustable door brace construction including diagonal braces set deep within the door and adjusting means for the braces readily accessible at the inner face of the door after the door is completely assembled.

A further object of my invention is to provide an improved adjustable door brace construction which is very inexpensive to manufacture and assemble within a refrigerator door.

In carrying out my invention I provide an adjustable cross brace construction for a refrigerator door of the type having an outer shell and an inner liner. The cross brace construction includes two diagonal cross braces which extend between diagonally opposite corners of the shell. Mounting members for the braces are attached to the shell at the corners, and by my invention, I provide an improved arrangement whereby the braces are adjustably secured between these members. In this arrangement, each brace is more or less rigidly secured to one of its opposite mounting members and is secured to the other by a movable bracket. This movable bracket includes a body portion and a pair of oppositely extending legs, one of which is attached to the brace and the other of which engages the mounting member. The bracket is held by a bolt extending between it and the mounting member, and the bolt and the mounting member are so arranged that they engage through rounded surface means. The bolt, in addition to holding the bracket, also serves as the means whereby the brace is adjusted. When the bolt is tightened, it tilts on the rounded surface means and thereby causes the bracket to pivot on the end of its leg engaging the mounting member. This pivoting of the bracket in turn applies tension to and tightens the brace, and thus results in a variation of the plane of the door to bring it in line with the face of the refrigerator cabinet.

The novel features which I believe to be characteristic of my invention are pointed out with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation may be best understood by reference to the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a front elevation view of a refrigerator having a door incorporating one embodiment of my cross-brace construction;

Fig. 2 is an elevational view of the inner face of the refrigerator door, the door liner being broken away to show details of the cross-brace construction;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2; and

Fig. 5 is a view similar to Fig. 4 showing an alternate embodiment of my invention.

Referring now to Fig. 1, I have shown therein a refrigerator 1 having a large door 2 for closing the access opening to its refrigerated compartment. A handle 3 is provided for tripping the door latch and opening the door. As is better shown in Figs. 2–4, the door includes an outer shell 4 of dished or pan-like construction. The shell 4 is preferably formed of relatively thin sheet metal and it includes a principal panel 5, an inwardly extending wall 6 which extends completely around the panel 5, and an inturned flange 7 at the inner end of the wall 6. The panel 5, as shown, comprises the outer wall of the door. Mounted on the shell 4 by means of the inner flange 7 is a door liner or inner wall 8. This door liner 8 includes a relatively deep recess 9 for accommodating a plurality of door shelves 10. The liner 8 is formed of suitable heat insulating plastic material so that no breaker strip is required between the flange 7 and the liner. The space between the shell 4 and the liner is however generally filled with suitable heat insulating material (not shown), such as fiber glass, in order to minimize heat leakage through the door. A sealing gasket 11 is mounted between the outer edge of the liner 8 and the flange 7 so as to seal off the refrigerated compartment of the refrigerator when the door is closed. The means whereby the liner 8 is secured to the flange 7 are not shown since it will be understood that any suitable means may be used.

A plurality of corner braces or gussets 12, 13, 14 and 15 are secured diagonally across the corners of the outer shell. These braces or gussets stiffen the shell and tend to prevent its deformation. The ends of the gussets are welded as indicated at 16 to the flange 7 of the shell.

During the manufacture of the refrigerator there may be some variation in the shape of the cabinet or the shape of the door so that the plane of the door, and particularly the plane of the sealing surface of the gasket 11, and the plane of the face of the cabinet are not parallel. This introduces the possibility of a gap between the sealing surface of the gasket and the face of the cabinet at some point. In order to provide for adjustment to bring the plane of the door and the plane of the face of the cabinet into coincidence cross braces 17 and 18 are provided. These cross braces extend respectively between diagonally opposite pairs of the corner gussets. Specifically, the brace 17 extends between the gussets 12 and 14 and the brace 18 between the gussets 13 and 15.

According to my invention I have provided new and improved means whereby these cross braces 17 and 18 are mounted and adjusted. These means allow the braces to be mounted deep within the door so as to allow room for the recess 9 of the liner but yet permit the ready adjustment of the braces even after the door has been completely assembled. In this arrangement the corner gussets serve as the mounting members for the braces. The two braces are mounted identically by means of their respective gussets so that the mounting of only one brace will be described herein. Specifically, the mounting of the brace 17 will now be described.

As shown, the brace 17 comprises a rod or wire having hooked portions 19 and 20 provided at its opposite ends. The lower end of the brace is mounted from the

lower corner gusset 14 by a rigid spacing means, such as, for example, the bolt member 21. The bolt member 21 extends inwardly into the door from the gusset 14, and is secured to the gusset by a suitable threaded portion 22 which is screwed into a tapped aperture in the gusset. At its opposite or inner end the bolt member 21 includes an aperture 23 through which the hooked end portion 19 of the brace 17 is fitted. This engagement between the bolt member and the hooked portion 19 serves to mount fixedly the lower end of the brace. It will be understood, of course, that other equivalent rigid members such as arms formed integrally with the gusset 14 could be substituted for the separate bolt member 21.

The opposite end of the brace 17 is adjustably mounted by means of a novel arrangement which is supported from the corner gusset 12. This arrangement includes a bracket 24 which has a principal body portion 25 and two legs 26 and 27. The legs 26 and 27 specifically extend in opposite directions at the ends of the body portion 25. The leg 27 extends inwardly into the door and near its inner end includes an aperture 28. The hooked end portion 20 of the brace is inserted through this aperture 28 and the bracket 24 thereby serves to mount the upper end of the brace. The other leg 26 extends outwardly toward the inner face of the door and at its outer end engages a flange 29 of the corner gusset 12. By comparing Figs. 3 and 4 it will be seen that the bracket 24 spaces the upper end of the brace the same distance inwardly from the inner face of the door as the bolt member 21 spaces the lower end of the brace. This spacing allows sufficient space for a deep recess such as the recess 9 to be formed in the door liner 8.

The bracket 24 serves as the means whereby the brace 17 is adjusted, the bracket being movable to effect the adjustment. Thus, for mounting the bracket 24 there is provided a bolt or fastening means 30. This bolt 30 extends through apertures 31 and 32 in the gusset 12 and the body portion 25 of the bracket respectively. Mounted between the head 33 of the bolt and the gusset 12 is a rocking member or washer 34 and mounted on the end of the bolt at the remote side of the body portion 25 of the bracket is a rocking member or nut 35. It will be noted that both these rocking members include a rounded surface. Thus the rocking member or washer 34 includes a rounded surface which engages the gusset 12 and the rocking member or nut 35 includes a rounded surface which engages the body portion 25 of the bracket. It will also be noted that the nut 35 includes a flatted surface 36 which engages the leg 27 of the bracket to prevent turning of the nut as the bolt is turned.

The action of these rocking members is effective to cause adjustment of the brace as the bolt is tightened. Specifically, as the bolt is tightened, these rocking members cause the brace to be tightened, and this in turn adjusts the plane of the inner face of the door so that it coincides with the plane of the face of the refrigerator cabinet. The action produced by these rocking members is shown by the dotted lines in Fig. 4. As the bolt is tightened, the nut 35 does not rotate and therefore is pulled toward the washer 34. This causes the bolt to tilt on the rounded surface of washer 34 and that in turn causes the bracket to pivot on the end of its leg 26. In other words, the tilting of the bolt causes a pivoting of the bracket around the point at which the leg 26 engages the gusset 12. The pivoting is toward the right as viewed in Fig. 4 so that the brace 17 is placed under tension. In other words, the distance between the bolt member 21 and the end of leg 27 is increased as the bracket pivots and this pulls on the brace and places it under tension. By continuing the turning of the bolt a sufficient movement of the bracket and the end of the brace may be effected to adjust the plane of the door to the desired position.

In the embodiment of Figs. 1–4, the cross braces may be adjusted after the door is completely assembled. It will be noted that in my preferred embodiment the head 33 of the bolt 30 lies adjacent the door liner 8. In other words, it is adjacent the inner face of the door. In order that the bolt may be turned and the cross brace adjusted after the door is completely assembled, I have provided suitable means for inserting a tool through the liner 8. This means comprises a removable cap or button 37 which is positioned over an aperture 38 in the liner. This aperture 38 directly overlies the head 34 of the bolt so that when the cap 37 is removed, a tool may be brought into direct contact with the bolt for turning it.

Referring now to Fig. 5, I have shown therein another embodiment of my adjustable door brace construction. Elements in this embodiment similar to those of the embodiment of Figs. 2–4 have been designated by the same numbers. In Fig. 5 only the adjustable mounting means for one end of the brace 17 have been shown, but it will be understood that the corresponding end of the brace 18 is mounted in exactly the same manner. It will also be understood that the other ends of the braces 17 and 18 are held by suitable rigid means attached to gussets or other members mounted at the opposite corners of the door. For example, they may be mounted by the means shown in Fig. 3.

In the arrangement of Fig. 5, the hooked end 20 of the brace 17 is held by means of a bracket 40. This bracket 40 includes a principal body portion 41 and two oppositely extending legs 42 and 43. The one leg 42 extends outwardly toward the inner face of the door 2 and at its outer end engages a flange 44 of a corner gusset 45 of the door shell 4. The other leg 43 of the bracket extends inwardly into the door and near its inner end is provided with an aperture 46 through which the hooked end 20 of the brace 17 is fitted. The leg 43 of the bracket thereby serves to mount the end of the brace. As shown, the bracket spaces the brace 17 inwardly from the inner face of the door far enough to allow for a deep recess 9 to be formed in the door liner 8.

It is by means of the bracket 40 that the brace 17 is adjusted, the bracket being movable to effect the adjustment. For both mounting and moving the bracket 40 there is provided a bolt or fastening means 47. This bolt 47 extends through an aperture 48 in the gusset 45 and is threaded into a dimple 49 provided in the body portion 41 of the bracket. The head 50 of the bolt engages a rounded surface provided by a raised boss 51 formed on the upper side of the gusset 45. In other words, the head of the nut and the gusset engage through rounded surface means.

The engagement between the bolt head 50 and the rounded boss 51 results in adjustment of the brace 17 as the bolt 47 is tightened. As the bolt is tightened, it pulls the body portion 41 of the bracket toward the gusset. This results in the bolt tilting on the rounded surface of the boss and that in turn causes the bracket to pivot as a whole around the end of its leg 42. This action is shown by the dotted lines in Fig. 5. The pivoting of the bracket 40 is to the right as viewed in Fig. 5 so that it pulls on the hooked end 20 of the brace 17 and places it under tension. As the tightening of the bolt is continued, this tension is increased, and by sufficiently tightening the bolt the bracket and the end of the brace may be moved far enough to adjust the plane of the door to the desired position.

In the embodiment of Fig. 5, as in the embodiment of Figs. 2–4, the cross braces may be adjusted after the door is completely assembled. In this embodiment, the head 50 of the bolt 49 lies adjacent the door liner 8. In order that the bolt may be turned after the door is completely assembled, means are provided whereby a tool may be inserted through the liner 8. This means comprises the removable cap or button 37 which is positioned over an aperture 38 in the liner. This aperture

38 directly overlies the head 50 of the bolt so that when the cap 37 is removed the tool may be engaged with the bolt for tightening it.

Thus, by my invention I have provided a door brace construction which permits the use of a door liner having a deep recess, but yet which is readily adjustable after the door is completely assembled. This cross brace construction consists of only a few parts which may be simple and easily fabricated. Further, its assembly within the door is a quick and uncomplicated process. As a result the cross brace construction is relatively inexpensive, which of course is a considerable advantage in a high production item such as refrigerators.

While in accordance with the patent statutes I have described what at present are considered to be the preferred embodiments of my invention it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from my invention, and I, therefore, aim in the appended claims to cover all such claims and modifications which fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a door for refrigerators or the like including an outer shell, two diagonal cross braces extending between opposite corners of said shell, and mounting members for said braces secured to said shell at the corners thereof, means for adjustably securing said cross braces between said mounting members, said means comprising for each of said cross braces a bracket supported from one mounting member thereof and mounting one end of the brace, and means securing the other end of said brace to the other mounting member thereof, said bracket having a body portion and first and second oppositely extending legs, said first leg engaging said one mounting member and said second leg being attached to said one end of said brace, a fastening means extending between said bracket and said one mounting member and securing said bracket to said mounting member, said fastening means and said one mounting member including a rounded surface forming the engagement between said fastening means and said one member and causing tilting of said fastening means upon the tightening thereof, whereby said tightening effects a pivoting of said bracket on the end of said first leg to apply tension to and tighten said brace.

2. In a door for refrigerators or the like including an outer shell, two diagonal cross braces extending between opposite corners of said shell, and mounting members for said braces secured to said shell at the corners thereof, means for adjustably securing said cross braces between said mounting members, said means comprising for each of said cross braces a bracket supported from one mounting member thereof and mounting one end of the brace, and means securing the other end of said brace to the other mounting member thereof, said bracket having a body portion and first and second oppositely extending legs, said first leg engaging said one mounting member and said second leg being secured to said one end of said brace, a bolt extending between said bracket and said one mounting member and securing said bracket to said mounting member, and a rounded surface formed on said one mounting member and engaged by the head of said bolt for causing tilting of said bolt upon the tightening thereof, whereby said tightening effects a pivoting of said bracket on the end of said first leg to apply tension to and tighten said brace.

3. In a door for refrigerators or the like including an outer shell, a corner gusset secured to said shell at each corner thereof, and two diagonal cross braces, one of said cross braces extending between two diagonally opposite gussets and the other of said cross braces extending between the remaining two diagonally opposite gussets, means for mounting and tightening said cross braces, said means comprising for each of said cross braces a bracket supported from one gusset thereof and a rigid member secured to the other gusset thereof, said rigid member mounting one end of said brace and said bracket mounting the other end of said brace, said bracket having a body portion and first and second oppositely extending legs, said first leg engaging said one gusset and said second leg being secured to said other end of said brace, a bolt extending between said bracket and said one mounting member and securing said bracket to said mounting member, a rounded surface formed on said one member and engaged by the head of said bolt for causing tilting of said bolt upon the tightening thereof, whereby said tightening effects a pivoting of said bracket on the end of said first leg to apply tension to and tighten said brace, said head of said bolt being adjacent the inner face of said door to allow adjustment of said brace after said door is completely assembled.

4. In a door for refrigerators and the like including an outer shell, two diagonal cross braces extending between opposite corners of said shell, and mounting members for said braces secured to said shell at each corner thereof, means for adjustably securing said cross braces between said mounting members, said means comprising for each of said cross braces a bracket supported from one mounting member thereof and a rigid member secured to the other mounting member thereof, said rigid member mounting one end of said brace and said bracket mounting the other end of said brace, said bracket having a body portion and first and second oppositely extending legs, said first leg engaging said one mounting member and said second leg being attached to said other end of said brace, said one mounting member and said body portion each having an aperture, a bolt extending through said apertures, a nut element mounted on said bolt and engaging said body portion, and a rocking element mounted on said bolt and having a rounded surface engaging said one mounting member, said rounded surface causing a tilting of said bolt upon the tightening thereof whereby said bracket is pivoted on the end of said first leg to apply tension to and tighten said brace.

5. In a door for refrigerators or the like including an outer shell, a corner gusset secured to said outer shell at each corner thereof, at least one of each pair of diagonal gussets having an upstanding flange, and two diagonal cross braces, one of said cross braces extending between two diagonally opposite gussets and the other of said cross braces extending between the remaining two diagonally opposite gussets, means for mounting and tightening said cross braces, said means comprising for each of said cross braces a bracket supported from said one gusset and a rigid member secured to the other gusset, said rigid member mounting one end of said brace and said bracket mounting the other end of said brace, said bracket having a body portion and first and second oppositely extending legs, said first leg engaging said flange of said one gusset and said second leg being attached to said other end of said brace, said one gusset and said body portion each having an aperture, a bolt extending through said apertures, a nut threaded on said bolt and having a rounded surface engaging said body portion, and a washer mounted on said bolt and having a rounded surface engaging said one gusset, said rounded surfaces causing a tilting of said bolt upon the tightening thereof whereby said bracket is pivoted on the end of said first leg to apply tension to and tighten said brace, the head of said bolt being adjacent the inner face of said door to allow adjustment of said brace after said door is completely assembled.

References Cited in the file of this patent

UNITED STATES PATENTS

2,591,352	Harbison	Apr. 1, 1952
2,630,605	Hobson et al.	Mar. 10, 1953