Dec. 6, 1960 G. I. JOHNSON 2,963,171

SWING-OUT PIVOTAL SHELF FOR REFRIGERATORS

Filed Feb. 17, 1958 2 Sheets-Sheet 1

Fig. 1

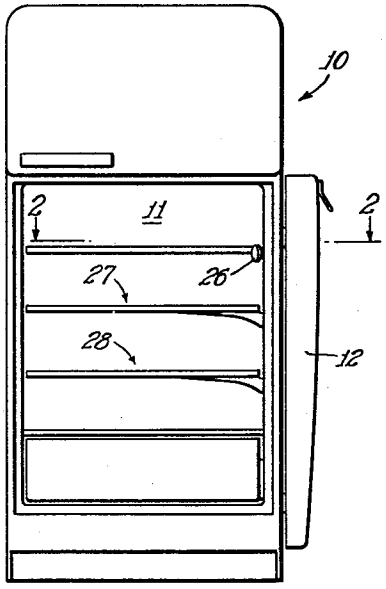


Fig. 6

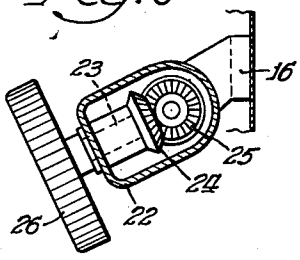
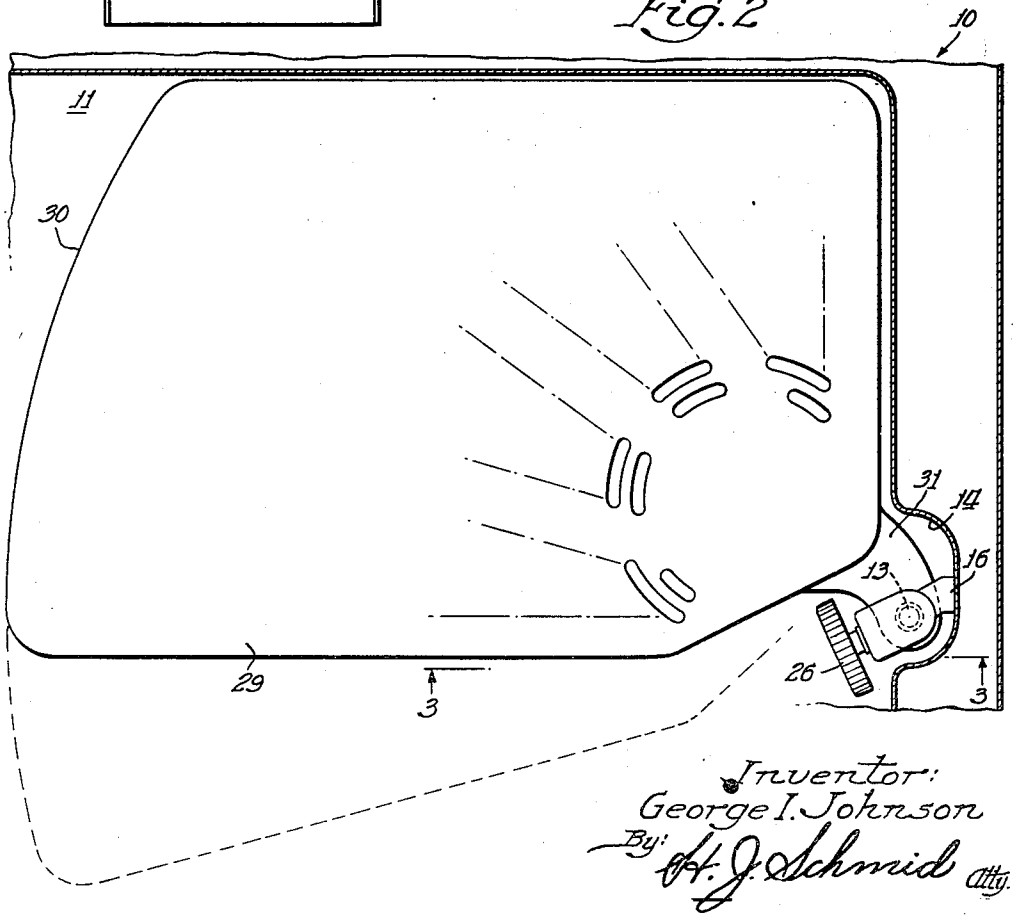


Fig. 2



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Filed Feb. 17, 1958 2 Sheets-Sheet 2

Fig. 3

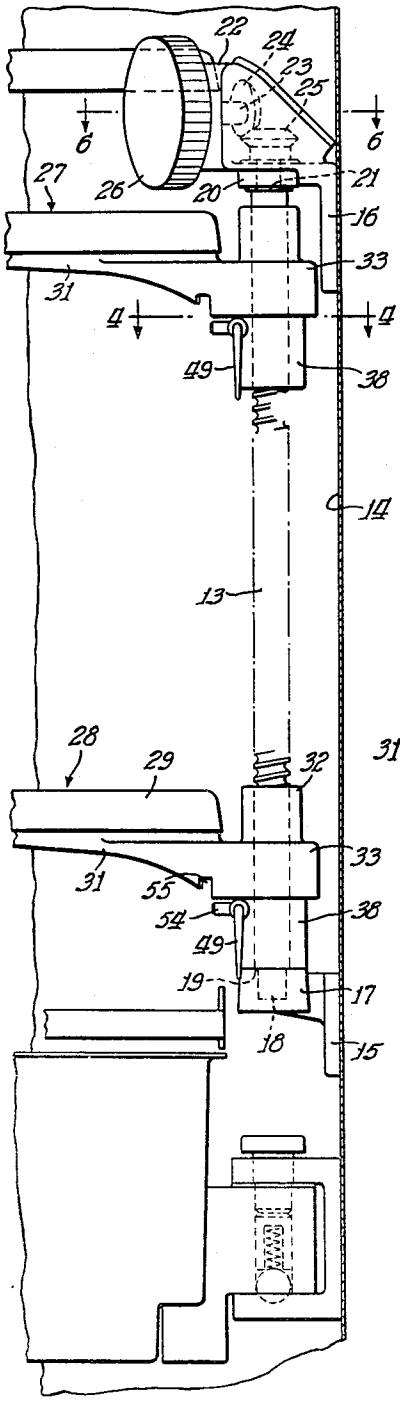


Fig. 4

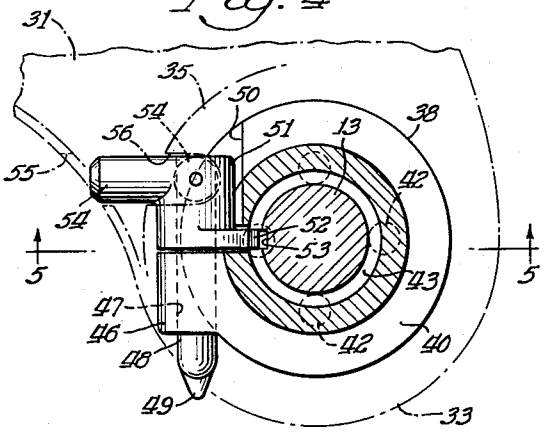
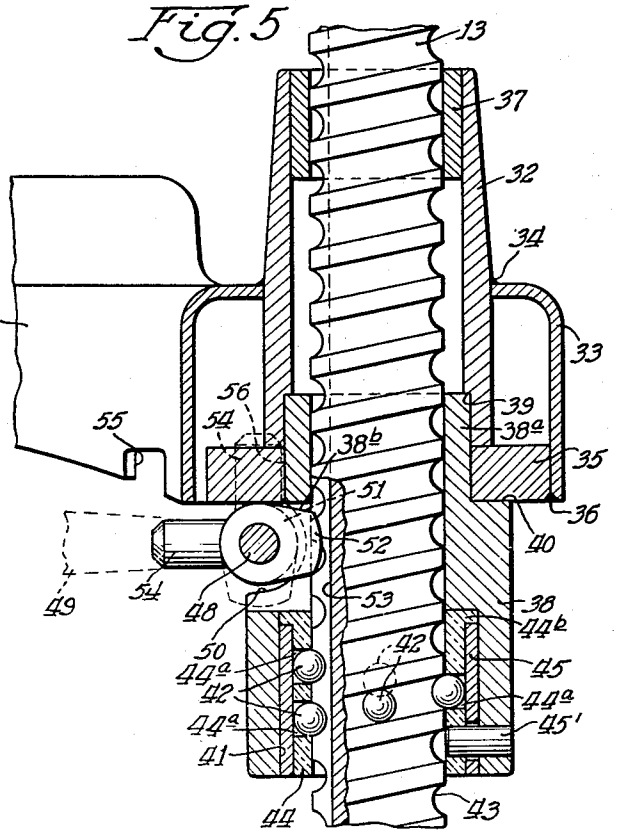


Fig. 5



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SWING-OUT PIVOTAL SHELF FOR REFRIGERATORS

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4 Claims. (Cl. 211—147)

This invention relates to adjustable shelf structure and more particularly to shelf structure having provision for vertically adjusting the shelf and for pivotal movement of the shelf.

An object of the invention is to provide an improved vertically adjustable pivotal shelf structure.

Another object of the invention is to provide an improved shelf structure having means providing for free pivotal movement of the shelf and controlling vertical adjustment of the shelf to any desired position.

Another object of the invention is to provide an improved shelf structure in which the shelf is pivotally movable about a shaft while being maintained at a desired height on the shaft; the shelf structure having associated latch mechanism operable to lock the shelf to the shaft during vertical adjustment of the shelf.

A further object of the invention is to provide an improved shelf structure in which the shelf is normally rotatable about a threaded shaft and maintained at a desired height on the shaft by a support having associated latch mechanism coupling the shelf to the shaft for vertical adjusting movement of the shelf upon rotation of the shaft.

A further object of the invention is to provide improved vertically adjustable pivotal shelf structures in which the shelves may be freely pivoted and may be selectively or concurrently vertically adjusted to desired heights.

Other objects, aims, and advantages of the improvements contemplated herein will be apparent to persons skilled in the art after the construction and operation of the present shelf structure is understood from the description. It is preferred to accomplish the numerous objects and advantages of this invention, and to practice the improvement, in substantially the manner hereinafter fully described and as more particularly pointed out in the appended claims. Reference is now made to the accompanying drawings which form a part of the specification.

In the drawings:

Fig. 1 is an elevational view of a refrigerator cabinet illustrating a preferred embodiment of the shelf structure;

Fig. 2 is a horizontal sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a front elevational view, partially broken away, of the shelf structure, said view being taken along the line 3—3 of Fig. 2;

Fig. 4 is a horizontal sectional view taken along line 4—4 of Fig. 3;

Fig. 5 is an enlarged vertical sectional view of the shelf support and latch mechanism of the shelf structure, said view being taken along the line 5—5 of Fig. 4; and

Fig. 6 is a horizontal sectional view taken along the line 6—6 of Fig. 3.

In Fig. 1, there is generally illustrated a refrigerator cabinet identified as a whole by the numeral 10 and comprising a food storage compartment 11, a door 12 providing access to the compartment 11. As shown in Figs. 2 and 3, a vertical threaded shaft 13 is supported within a recess 14 in the side wall of the compartment 11 by brackets 15 and 16 disposed in the recess 14 and attached to the wall. The lower bracket 15 has a cylindrical bearing portion 17 receiving a reduced end portion 18 on the lower end of the shaft and defining a shoulder 19 engaged with the upper surface of the bracket 15 for rotatably supporting the lower end of the shaft 13. The upper end of the shaft 13 extends through and is journalled in a bearing 20 of the bracket 16 with the upper end of the shaft being reduced to define a shoulder 21 engaging the bottom surface of the bearing 20 of the bracket 16. The bracket 16 is further provided with an upstanding flange 22 receiving a rotatable shaft 23 having fixed at one end thereof a miter gear 24 meshing with a miter gear 25 on the upper end portion of the shaft 13, the gears rotating the shaft by operation of a hand wheel 26 fixed to the shaft 23.

A plurality of adjustable shelves generally indicated at 27 and 28 are pivotally supported on the shaft 13 and are also vertically adjustable on the shaft by operating mechanisms associated with the shelves and shaft 13. As the shelves 27 and 28 and their operating mechanisms are identical, the shelf 27 and its operating mechanism will only be described. As seen in Fig. 2, the shelf 27 comprises a substantially rectangular plate 29 having its edges positioned in close proximity to the inner liner of the food storage compartment 11 with the exception of the side edge 30 of the shelf 29 which is formed arcuate in shape to permit the shelf to pivot about the shaft 13 without interference with the liner of the food compartment.

The plate 29 is removably supported upon a spider 31 pivotally connected to the shaft 13. More particularly, the spider 31 is provided with a collar surrounding the shaft and comprising a sleeve 32 extending through a hollow inverted cup-shaped member or shell 33 formed integral with the spider and welded to the sleeve 32 as at 34. The collar of the spider further comprises a ring 35 surrounding the shaft and inserted within the open lower end of the shell 33 and welded thereto as at 36. The upper end of the sleeve 32 is provided with a bearing 37 disposed between the sleeve 32 and the shaft 13 and fixed to the sleeve 32 for movement therewith relative to the shaft 13.

The spider 31 is pivotally supported on the shaft 13 by a cylindrical bearing 38 surrounding and engaging the shaft 13 and having a reduced cylindrical upper end 38*a* engaging the sleeve 32 and ring 35 of the collar and providing a shoulder 40 engaging the ring 35, the sleeve 32 also having a shoulder 39 engaging the top of the sleeve 38. It will be seen that, as the shell 33 of the spider is welded to the sleeve 32 and the ring 35, that these parts, forming the collar of the spider, permit the spider to freely pivot about the supporting bearing sleeve 38.

Vertical adjustment of the spider, and thereby the shelf, may be obtained by the mechanism now to be described. The sleeve 38 is provided with an enlarged cylindrical cavity 41 receiving an adjusting device connecting the sleeve 38 with the threaded shaft 13 for vertical movement of the sleeve 38. More specifically, this device comprises a plurality of balls 42 received within the spiral groove 43 in the exterior of the shaft 13 and defining the screw thread on the shaft, the balls being confined in the groove by a cylindrical sleeve or retainer 44 having spaced openings 44*a* therein receiving the balls 42, the ball retainer being preferably formed of plastic, such as nylon. A cylindrical ball race 45

surrounds the retainer 44 and has its upper end engaging a peripheral flange 44*b* on the retainer 44, the retainer 44 and ball race 45 being retained in assembly with the sleeve 38 by a pin 45 extending through aligned openings in the sleeve 38, the race 45, and the retainer 44. As shown in Fig. 5, disposition of the balls 42 in the spiral groove in the shaft 13 and the openings in the retainer 44 provides a connection between the shaft 13 and the sleeve 38 to support the spider upon the shaft 13.

To prevent pivotal movement of the sleeve 38 and also the balls 42 about the shaft 13, the sleeve 38 is formed with a boss 46 (Figs. 4 and 5) projecting outwardly of the sleeve 38 and having a cylindrical opening 47 receiving and rotatably mounting a pin 48, the pin having a knurled end portion for a handle 49. The opposite end of the pin 48 projects outwardly of the boss 46 of the sleeve 38 into a substantially triangular recess 50 in the sleeve 38 located at one side of the boss and is connected to a latch member 51 having an outwardly projecting nose or key portion 52 at one side thereof extending through an opening 38*b* in the sleeve 38 and into a longitudinally extending slot or keyway 53 in the shaft 13 and interrupting the screw thread on the shaft, as clearly shown in Fig. 5. With the key portion 52 of the latch member 51 extending within the keyway 53 in the shaft 13, it will be apparent that the sleeve 38 and the shaft 13 will be coupled together to prevent relative pivotal movement despite rotation of the shaft 13 by the miter gear arrangement disposed at the upper end of the shaft. As a result, in the position of the parts shown in Figs. 4 and 5, rotation of the shaft 13 will be ineffective to cause vertical movement of the sleeve 38 through the medium of the balls 42 and, as the sleeve 38 and shaft 13 are coupled together the shelf 29 and spider 31 may be freely moved about the screw 13 without vertical movement of the tray and spider.

In the event it is desired to couple the spider 27 to the shaft 13 for vertical adjusting movement, the latch member 51 is provided with a radially extending coupling portion 54 disposed diametrically opposite the key portion 52 so that, upon rotation of the member 51 by movement of the handle 49 to the raised dotted-line position (Fig. 5), the coupling portion 54 will move through an opening 55 in the spider 31 and into a slot or notch 56 formed in the ring 35 of the collar of the spider 31 to latch the collar to the sleeve 38. As the coupling portion 54 moves into the slot 56 in the ring 35, it will be seen that the key portion 52 will be moved out of the slot 53 in the shaft to permit relative rotation of the sleeve 38 and the shaft 13. Accordingly, with the coupling portion 54 disposed within the slot 56 of the ring 35, the spider 31 and the sleeve 38 are directly coupled together for vertical adjusting movement upon rotation of the hand wheel 26 and operation of the miter gear arrangement to rotate the shaft 13.

It will be apparent that, with the handle 49 in its horizontal position, rotation of the shaft 13 will move the balls 42 in the groove 43 in the shaft either upwardly or downwardly depending on the direction of rotation of the hand wheel 26. As seen in Fig. 3, rotation of the handwheel 26 in a clockwise direction will rotate the shaft 13 to effect movement of the balls 42 upwardly along the spiral groove 43 in the shaft 13 to raise the ball retainer 44 and the sleeve 38 to also effect upward movement of the sleeve 38 and thereby the spider 31 and plate 29 to a desired height on the shaft 13. In the event it is desired to vertically adjust the spider 31 and plate 29 to a lower position on the shaft 13, rotation of the handwheel 26 in a counterclockwise direction will rotate the shaft 13 to cause the balls 42 to move downwardly in the spiral groove 43 in the shaft 13 to thereby cause the sleeve 38, the spider 31 and plate 29 to be lowered until a predetermined desired position on the shaft 13 is reached. After the vertical adjustment of the shelf, the handle 49 is rotated to its vertical position shown in the drawings to disconnect the sleeve 38 from the ring 35 and to permit the spider 31 to pivot freely about the shaft 13 while the key portion 52 of the latch member 51 will be received within the slot 53 in the shaft 13 to prevent relative rotation between the sleeve 38 and the shaft 13 and thus maintain the spider 31 and plate 29 in the desired position.

It will be observed that each of the shelves 27 and 28 may be adjusted independently over the other by properly positioning the handles to permit vertical movement of the selected shelf while preventing similar movement of the other shelf upon rotation of the threaded shaft; or, both shelves may be concurrently vertically adjusted when the handles are moved to their horizontal positions and the shaft rotated.

While this invention has been described in its preferred form or embodiment, it will be apparent to persons skilled in the art, after understanding the improvements, the various changes and modifications, may be made therein without departing from the spirit or scope thereof. It is aimed in the appended claims to cover all such changes and modifications.

What is claimed is:

1. A vertically adjustable, pivotal shelf structure comprising a rotatable vertical shaft having a spiral groove defining a screw thread on said shaft, and provided with a longitudinally extending keyway; a nut assembly including balls positioned in said groove, and a retainer for said balls; a sleeve surrounding said shaft and said retainer and secured to said retainer; a pivotal shelf having a collar surrounding said shaft and seated on said sleeve; a member pivoted on said sleeve and having a key portion movable into said shaft keyway to prevent relative rotation of said sleeve and shaft, and having a coupling portion movable to connect said collar and sleeve for conjoint vertical movement of said sleeve and collar by said ball assembly during rotation of said shaft; manually operative means for effecting pivotal movement of said member to connect said coupling portion thereof with said collar while retracting said key portion thereof from said shaft keyway; and means for rotating said shaft.

2. A vertically adjustable, pivotal shelf structure comprising a rotatable vertical shaft having a spiral groove defining a screw thread on said shaft, and provided with a longitudinally extending keyway; a nut assembly including a plurality of balls in said groove, and a retainer surrounding said shaft and having spaced openings receiving said balls; a sleeve surrounding said shaft and receiving said nut assembly and having said retainer secured thereto; a shelf having a collar surrounding said shaft and pivotally supported on said sleeve; a latch member pivotally mounted on said sleeve and having diametrically oppositely laterally extending key and coupling portions, said key portion being movable into said shaft keyway to prevent relative rotation of said sleeve and shaft and said coupling portion being movable to connect said sleeve and collar, pivotal movement of said latch member retracting said key portion thereof from said shaft keyway and moving said coupling portion thereof to connect said sleeve and collar for conjoint movement of said sleeve and shelf vertically of said shaft during rotation of said shaft and movement of said balls along said groove in said shaft; and means for rotating said shaft.

3. A vertically adjustable, pivotal shelf structure comprising a rotatable vertical shaft having a spiral groove defining a screw thread on said shaft, and provided with a longitudinally extending keyway; a plurality of balls in said groove; a retainer surrounding said shaft and having spaced openings receiving said balls; a sleeve surrounding said shaft and having an enlarged bore at one end thereof for receiving said retainer and balls; a pin extending radially of said shaft and through aligned open-

ings in said sleeve and retainer; a shelf having a collar surrounding said shaft and pivotally supported on said sleeve, said collar having a slot in one edge thereof; a latch member pivotally mounted on said sleeve and having diametrically oppositely laterally extending key and coupling portions, pivotal movement of said latch member in one direction moving said key portion thereof into said shaft keyway to prevent relative rotation of said sleeve and shaft and moving said coupling portion thereof from said slot in said collar, and pivotal movement of said latch member in the other and opposite direction retracting said key portion thereof from said shaft keyway and moving said coupling portion thereof into said slot in said collar to connect said collar with said sleeve for conjoint vertical movement of said sleeve and shelf on said shaft during rotation of said shaft and movement of said balls along said groove in said shaft; and means for rotating said shaft.

4. A vertically adjustable, pivotal shelf structure comprising a rotatable vertical shaft having a spiral groove defining a screw thread on said shaft, and provided with a longitudinally extending keyway; a plurality of balls in said groove; a retainer having spaced openings receiving said balls; a cylindrical ball race receiving said retainer and holding said balls in said groove and said retainer; a sleeve surrounding said shaft and having an enlarged bore at one end thereof for receiving said balls, retainer and race; a pin extending radially of said shaft and through aligned openings in said sleeve, race and retainer; a shelf

having a collar surrounding said shaft and pivotally supported on said sleeve, said collar having a slot in one edge thereof; a latch member pivotally mounted on said sleeve and having diametrically oppositely laterally extending key and coupling portions, pivotal movement of said latch member in one direction moving said key portion thereof into said shaft keyway to prevent relative rotation of said sleeve and shaft and moving said coupling portion thereof from said slot in said collar, and pivotal movement of said latch member in the other and opposite direction retracting said key portion thereof from said shaft keyway and moving said coupling portion thereof into said slot in said collar to connect said collar with said sleeve for conjoint vertical movement of said sleeve and shelf on said shaft during rotation of said shaft and movement of said balls along said groove in said shaft; and means for rotating said shaft.

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