June 27, 1961 H. J. TOPEL 2,990,068

ADJUSTABLE SHELF MECHANISM FOR A REFRIGERATOR

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Fig. 1

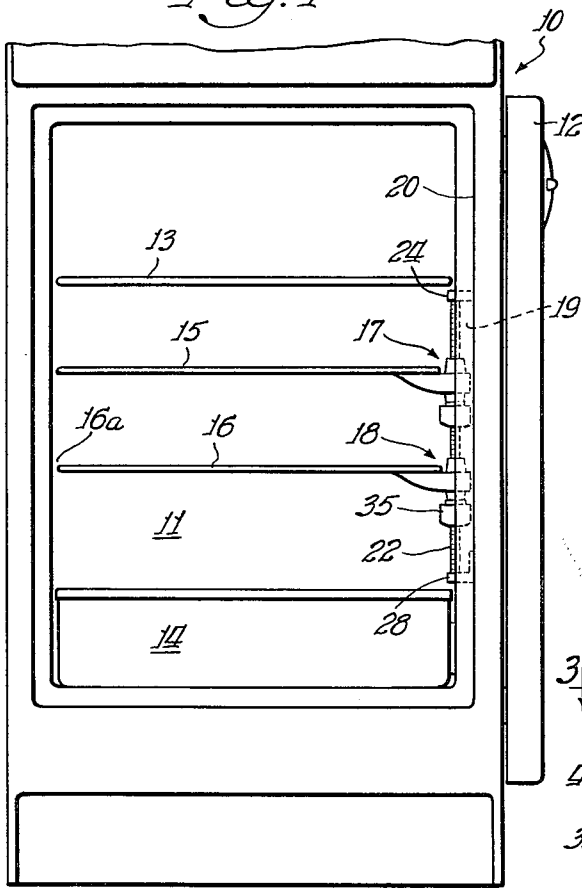


Fig. 2

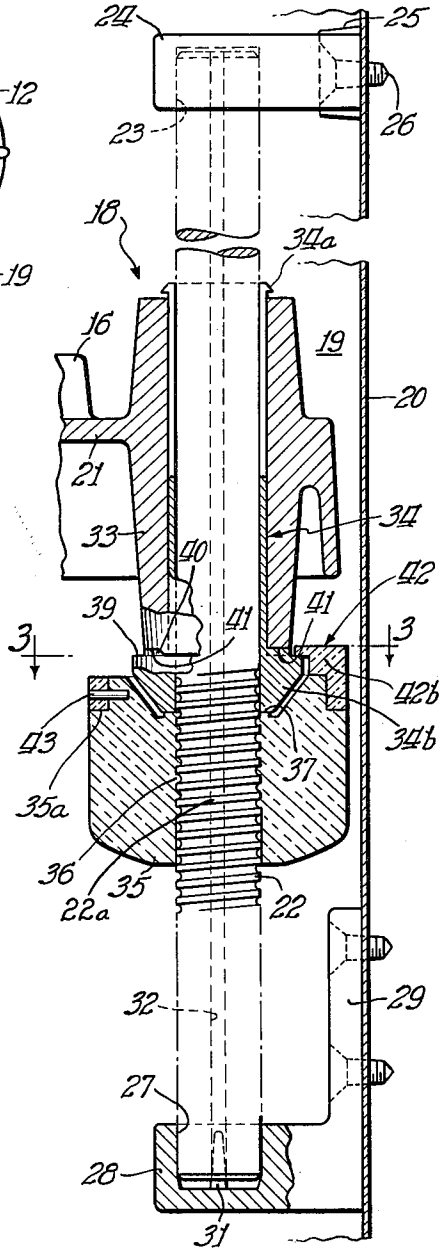
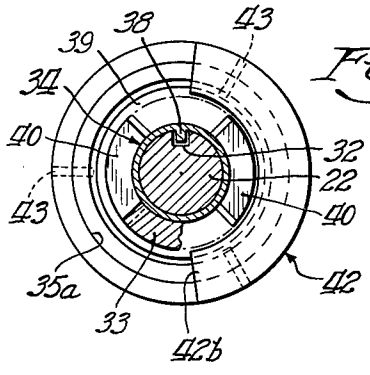


Fig. 3



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ADJUSTABLE SHELF MECHANISM FOR A REFRIGERATOR

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

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

Another object of the invention is to provide an improved shelf structure having means providing for free rotative 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 rotatable about a shaft and maintained at a desired height on the shaft by a support having means constantly coupling the shelf to the shaft for rotative movement and manually operable for vertical adjusting movement of the shelf.

A specific object of the invention is to provide a novel shelf structure in which the shelf is supported for rotation about a cylindrical member keyed to a fixed threaded shaft and having bearing engagement with a supporting rotatable nut member, threaded on the shaft, for effecting vertical movement of the cylindrical member and thereby the shelf.

Other objects, aims, and advantages of the improvement 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 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 drawing which forms a part of the specification.

In the drawing:

FIG. 1 is a front view of a refrigerator cabinet having the improved shelf structure in the food storage compartment thereof and showing the compartment access door in open position;

FIG. 2 is a front elevational view, partially broken away, of the shelf structure; and

FIG. 3 is a sectional view of the shelf structure, said section being taken on line 3—3 of FIG. 2.

Referring to FIG. 1, there is generally illustrated a refrigerator cabinet identified as a whole by the numeral 10 and comprising food storage compartment 11 and a door 12 providing access to the compartment 11. The compartment 11 contains a fixed support shelf 13 and a container 14 for vegetables and the like, and a plurality of shelves 15 and 16 movable into and out of the food compartment and also vertically adjustable to different heights to accommodate storage of foods between the shelves.

The present invention is directed to the devices controlling the rotational movement of the shelves 15 and 16 into and out of the food storage of the compartment of the refrigerator and also for adjusting the vertical heights of the shelves 15 and 16. These devices are generally indicated by the reference numerals 17 and 18 and, as both of these devices are identical, it is believed a description of one of these devices will suffice for describing the structural mechanism and its operation for accomplishing the rotative and vertical adjustment movements of the shelves 15 and 16.

With reference to the typical device 18 and referring now to FIGS. 2 and 3 illustrating details of the device, it will be seen that the shelf 16 is connected to the device 18 which is positioned partially within the food storage compartment 11 and a longitudinally vertically extending recess 19 in that portion of the liner 20 forming one of the side walls of the refrigerator adjacent the hinged connection of the door 12 to the refrigerator. More particularly, the shelf 16 may comprise a substantially rectangular plate having its edges positioned in close proximity to the inner liner 20 of the food storage compartment 11 with the exception that the side edge 16*a* of the shelf may be formed arcuate in shape to permit the shelf to freely pivot into and out of the compartment without interference with the liner 20 of the food compartment.

The shelf 16 may be positioned on, and is removable from, a spider 21 of substantially the same area as the shelf and pivotally connected to a shaft 22 extending vertically of the refrigerator compartment and having its upper end received within a cylindrical bearing 23 formed in a bracket 24 having an angularly offset portion 25 which is secured to the liner 20 and to a portion of the adjacent frame of the refrigerator by the screw 26 extending through an opening in the angularly offset portion 25 of the bracket 24 and the liner 20 and threaded into the adjacent wall of the frame of the refrigerator. The lower end of the shaft 22 is supported in a cylindrical opening or recess 27 formed in a bracket 28 which, as shown in FIG. 2, has an upwardly extending portion 29 engageable with the liner 20 of the refrigerator and having openings therein for receiving screws securing the bracket to the adjacent wall of the frame of the refrigerator. As seen in FIG. 2, the bracket 28 is provided with a rib 31 on the side wall of the recess 27 received within a slot 32 in the shaft 22 for preventing rotative movement of the shaft relative to its supporting brackets 24 and 28. It will be apparent that the shaft slot 32 extends longitudinally thereof from the top to the bottom and for a further purpose to be described hereinafter.

Referring now more particularly to the device 18 for supporting the shelf 16 on the shaft 22 and also for rotation about the shaft and for vertical adjusting movement of the shelf 16, the shelf-supporting spider 21 has a downwardly and outwardly extending cylindrical member or bearing sleeve 33 formed integral therewith and surrounding the shaft 22. Disposed between the spider sleeve 33 and the shaft 22 is a cylindrical bushing or bearing 34 receiving the shaft 22 and extending along the shaft beyond the upper end of the sleeve 33 with the upper end of the bushing 34 having a laterally extending circular flange 34*a* overlying the upper end of the sleeve 33 and with the lower end of the bushing 34 having an enlarged truncated cone portion 34*b* received within a similarly shaped recess in an adjusting nut 35 having its threads 36 engaging a portion of the threads 22*a* formed on and extending along the shaft from the top to the bottom thereof as clearly shown in FIG. 2. The bushing 34 has its bottom end bearing against and supported on a bearing surface 37 of the nut 35 located at the bottom of the recess in the nut 35. The bushing 34 is prevented from rotating relative to the shaft 22, shelf 16, and nut by a key 38 integral with and projecting radially from the inner cylindrical wall of the bushing 34 into the longitudinally extending slot or keyway 32 formed in the shaft 22. The adjustment nut 35 and the bushing 34 may be formed of any suitable plastic composition, such as nylon.

It will be apparent that the keyed connection of the bushing 34 and shaft 22 prevents free rotation of the bushing 34 relative to the shaft while permitting vertical movement of the bushing 34. As the sleeve 33 of the spider 21 has a cylindrical bearing engagement with the

bushing 34, the spider 21 and shelf 16 may be freely rotated about the shaft for movement into and out of the refrigerator storage compartment. Also, as the spider sleeve 33 is seated and supported on the portion 34*b* of the bushing 34 which engages the nut 35, the nut 35 serves to support and maintain the spider 21 and shelf 16 at a predetermined desired height in the refrigerator compartment. It will be apparent that, upon rotation of the nut 35, the bushing 34, spider 21 and the shelf 16 will be moved vertically of the shaft either to raise or lower the shelf 16 to any desired height in the refrigerator compartment. It will be noted that the bushing 34 is keyed to the shaft so that any rotative movement of the shelf 16 will not be effective to rotate the bushing 34 and thereby the nut 35 so that, once the adjustment nut 35 has been operated to move the shelf 16 to a desired height, the shelf may be freely rotated without any possible influencing motion being translated to the adjustment nut 35.

Referring to FIGS. 2 and 3, the top surface 39 of the cone shaped portion 34*b* of the bushing 34 is provided with diametrically spaced bosses 40, 40 received within diametrically spaced recesses 41, 41 formed in the bottom of the sleeve 33 serving to releasably retain the shelf 16 within the refrigerator compartment and restrain the shelf against unwanted outward movement from the compartment. As the bushing rotatably supports the shelf and is held against rotative movement by the shaft, manual rotation of the shelf for movement outwardly of the refrigerator will disengage the bosses 40, 40 of the bushing from the recesses 41, 41 in the sleeve 33.

The adjustment nut 35 is provided with a retainer ring 42 surrounding and disposed within a notch 35*a* in the top of the nut, the ring being formed of plastic and fixed to the plastic nut by three pins 43 extending through the ring and into the nut 35, as shown in FIGS. 2 and 3. The ring 42 has an upper stepped portion 42*b* engaging the upper side and top of the portion 34*b* of the bushing 34, the portion 42*b* of the ring extending semi-circularly and being effective, upon rotation of the adjustment nut 35 downwardly, to rotatably engage the portion 34*b* of the bushing 34 to insure downward movement of the bushing and thereby the shelf 16.

It will be apparent from the foregoing description that I have provided a shelf structure having a simple, economical, easily manipulatable and efficient device for permitting pivotal movement of the shelves into and out of the refrigerator compartment while providing for the vertical adjustment of the shelves to any desired positions within the refrigerator storage compartment.

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, that various changes and modifications may be made without departing from the spirit and scope thereof, and it is aimed in the appended claims to cover all such changes and modifications.

What is claimed is:

1. A shelf structure comprising a fixed vertical shaft member; a shelf having a sleeve receiving said shaft member; a cylindrical member disposed between said sleeve and shaft member permitting rotation of said shelf relative to said shaft member and having a portion extending below and positioned beneath and engaging said sleeve; means connecting said cylindrical member and shaft member permitting movement of said cylindrical member longitudinally of said shaft member and preventing rotation of said cylindrical member relative to said shaft member, said means including a vertical keyway in one of said members and a key formed integral with the other of said members and received within said keyway; and means engaging said shaft member and disposed beneath and engaging said portion of said cylindrical member to support said cylindrical member and shelf and operative to vertically move said cylindrical member and said shelf on said shaft member.

2. A shelf structure comprising a fixed vertical threaded shaft member; a shelf having a sleeve receiving said shaft member; a cylindrical member disposed between said sleeve and shaft member permitting rotation of said shelf relative to said shaft member and having a portion extending below and positioned beneath and engaging said sleeve; means connecting said cylindrical member and shaft member permitting movement of said cylindrical member longitudinally of said shaft member and preventing rotation of said cylindrical member relative to said shaft member, said means including a vertical keyway in one of said members and a key formed integral with the other of said members and received within said keyway; and a nut in threaded engagement with said shaft member and disposed beneath and engaging said portion of said cylindrical member to support said cylindrical member and shelf and rotatable to vertically move said cylindrical member and said shelf on said shaft member.

3. A shelf structure as defined in claim 2 wherein cooperating means are provided on said engaged sleeve and portion of said cylindrical member for releasably restraining rotative movement of said shelf in one of the positions to which the shelf is rotated.

4. A shelf structure comprising a fixed vertical shaft; a shelf having a sleeve receiving said shaft; a bearing engaging said sleeve and shaft permitting rotation of said shelf relative to said shaft; means connecting said bearing and shaft permitting movement of said bearing longitudinally of said shaft and preventing rotation of said bearing relative to said shaft, said means including a vertical keyway in said shaft and a key formed integral with said bearing and received within said key way; and means engaging said shaft and cooperating with said bearing to support said bearing and shelf on said shaft and operative to vertically move said bearing and said shelf on said shaft.

5. A shelf structure as defined in claim 4 wherein engageable cooperating means are provided on said sleeve and bearing for releasably restraining rotative movement of said shelf in one of the positions to which the shelf is rotated.

6. A shelf structure comprising a fixed vertical threaded shaft; a shelf having a sleeve surrounding said shaft; a bearing engaging said sleeve and shaft permitting rotation of said shelf relative to said shaft; means connecting said bearing and shaft permitting movement of said bearing longitudinally of said shaft and preventing rotation of said bearing relative to said shaft, said means including a vertical keyway in said shaft and a key formed integral with said bearing and received within said key way; and a nut in threaded engagement with said shaft and disposed beneath and cooperating with said bearing and rotatable to vertically move said bearing and said shelf on said shaft.

7. A shelf structure comprising a fixed vertical threaded shaft provided with a longitudinally extending keyway; a shelf having a sleeve receiving said shaft; a cylindrical member within said sleeve and disposed between said sleeve and shaft permitting rotation of said shelf relative to said shaft, and having a key integral therewith and immovable relative thereto received within said shaft keyway for preventing rotation of said member relative to said shaft, said member having a portion extending below and positioned beneath and engaging said sleeve; and means engaging said shaft and disposed beneath and engaging said portion of said member to support said member and shelf and operative to vertically move said member and said shelf on said shaft.

8. A shelf structure comprising a fixed vertical threaded shaft provided with a longitudinally extending keyway; a shelf having a sleeve receiving said shaft; a cylindrical member within said sleeve and disposed between said sleeve and shaft permitting rotation of said shelf relative to said shaft, and having a key integral therewith and immovable relative thereto received within said shaft keyway for preventing rotation of said member relative to

said shaft, said member having a portion extending below and positioned beneath and engaging said sleeve; and a nut in threaded engagement with said shaft and disposed beneath and cooperating with said portion of said member to support said member and shelf and rotatable to vertically move said cylindrical member and said shelf on said shaft.

9. A shelf structure comprising a fixed vertical shaft provided with a longitudinally extending keyway; a shelf having a sleeve receiving said shaft; a bearing within said sleeve and disposed between said sleeve and shaft permitting rotation of said shelf relative to said shaft, and having a key formed integral with and immovable relative to said bearing and received within said shaft keyway for preventing rotation of said bearing relative to said shaft; and means engaging said shaft and disposed beneath and cooperating with said bearing to support said bearing and shelf on said shaft and operable to vertically move said bearing and said shelf on said shaft.

10. A shelf structure as defined in claim 9 wherein engageable cooperating means are provided on said sleeve and bearing for releasably restraining rotative movement of said shelf in one of the positions to which the shelf is rotated.

11. A shelf structure comprising a fixed vertical threaded shaft provided with a longitudinally extending keyway; a shelf having a sleeve receiving said shaft; a bearing within said sleeve and disposed between said sleeve and shaft permitting rotation of said shelf relative to said shaft, and having a key integral with said bearing and extending within said shaft keyway for preventing rotation of said member relative to said shaft, said member having a portion extending below and positioned beneath and engaging said shaft sleeve; and a nut in threaded engagement with said shaft and disposed beneath and cooperating with said bearing portion to support said bearing and shelf on said shaft and rotatable to vertically move said bearing and said shelf on said shaft.

12. A self structure comprising a fixed vertical threaded shaft provided with a longitudinally extending keyway; a shelf having a cylindrical sleeve surrounding said shaft; a cylindrical member within said sleeve and disposed between said sleeve and shaft permitting rotation of said shelf relative to said shaft, said member having a key received within said shaft keyway for preventing rotation of said member relative to said shaft, said member having an enlarged frusto-conical portion extending below and positioned beneath and engaging said shaft sleeve; and a nut in threaded engagement with said shaft and disposed beneath and engaging said portion of said member, said nut having a recess in the top thereof formed to receive said portion of said member, said nut supporting said member and sleeve on said shaft and being rotatable to vertically move said member and said shelf on said shaft.

13. In a shelf structure as defined in claim 12 wherein the nut is provided with a retainer secured thereto and overlying the top of said portion of said member to provide a connection between said nut and member insuring vertical travel of said nut and shelf along said shaft upon rotation of said nut.

14. A shelf structure comprising a fixed vertical threaded shaft provided with a longitudinally extending keyway; a shelf having a cylindrical sleeve surrounding said sleeve; a cylindrical member within said sleeve and disposed between said sleeve and shaft permitting rotation of said shelf relative to said shaft, said member having a key received within said shaft keyway for preventing rotation of said member relative to said shaft, said member having an enlarged frusto-conical portion disposed below and positioned beneath and engaging said shaft sleeve; a nut in threaded engagement with said shaft and disposed beneath and engaging said portion of said member, said nut having a recess in the top thereof formed to receive said portion of said member, said nut supporting said member and sleeve on said shaft and being rotatable to vertically move said member and said shelf along said shaft; and spaced upwardly extending projections on the top of said portion of said member adapted to be received within spaced recesses in the lower end of said sleeve for releasably maintaining said shelf in one of the positions to which the shelf is rotated.

15. A shelf structure comprising a fixed vertical threaded shaft provided with a longitudinally extending keyway; a shelf having a cylindrical sleeve surrounding said sleeve; a cylindrical member within said sleeve and disposed between said sleeve and shaft permitting rotation of said shelf relative to said shaft, said member having a key received within said shaft keyway for preventing rotation of said member relative to said shaft, said member having an enlarged frusto-conical portion disposed below and positioned beneath and engaging said shaft sleeve; a nut in threaded engagement with said shaft and disposed beneath and engaging said portion of said member, said nut having a recess in the top thereof formed to receive said portion of said member, said nut supporting said member and sleeve on said shaft and being rotatable to vertically move said member and said shelf along said shaft; a retainer secured to said nut and overlying the top of said portion of said member to provide a connection between said nut and member insuring vertical travel of said nut and shelf along said shaft upon rotation of said nut; and spaced upwardly extending projections on the top of said portion of said member adapted to be received within spaced recesses in the lower end of said sleeve for releasably maintaining said shelf in one of the positions to which the shelf is rotated.

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