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VERTICALLY ADJUSTABLE REFRIGERATOR SHELVES

Filed March 26, 1957

3 Sheets-Sheet 1

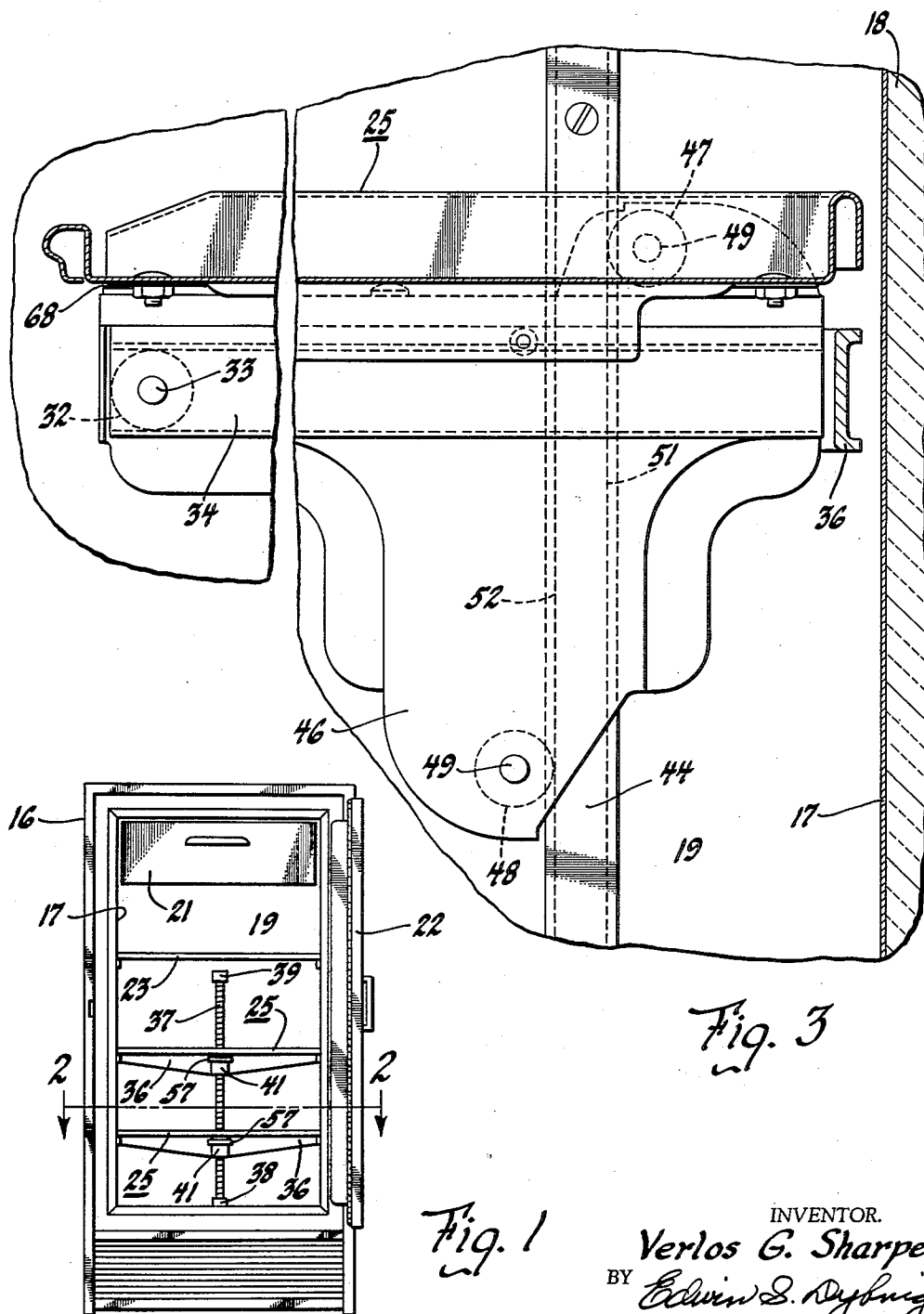


Fig. 3

Fig. 1

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3 Sheets-Sheet 2

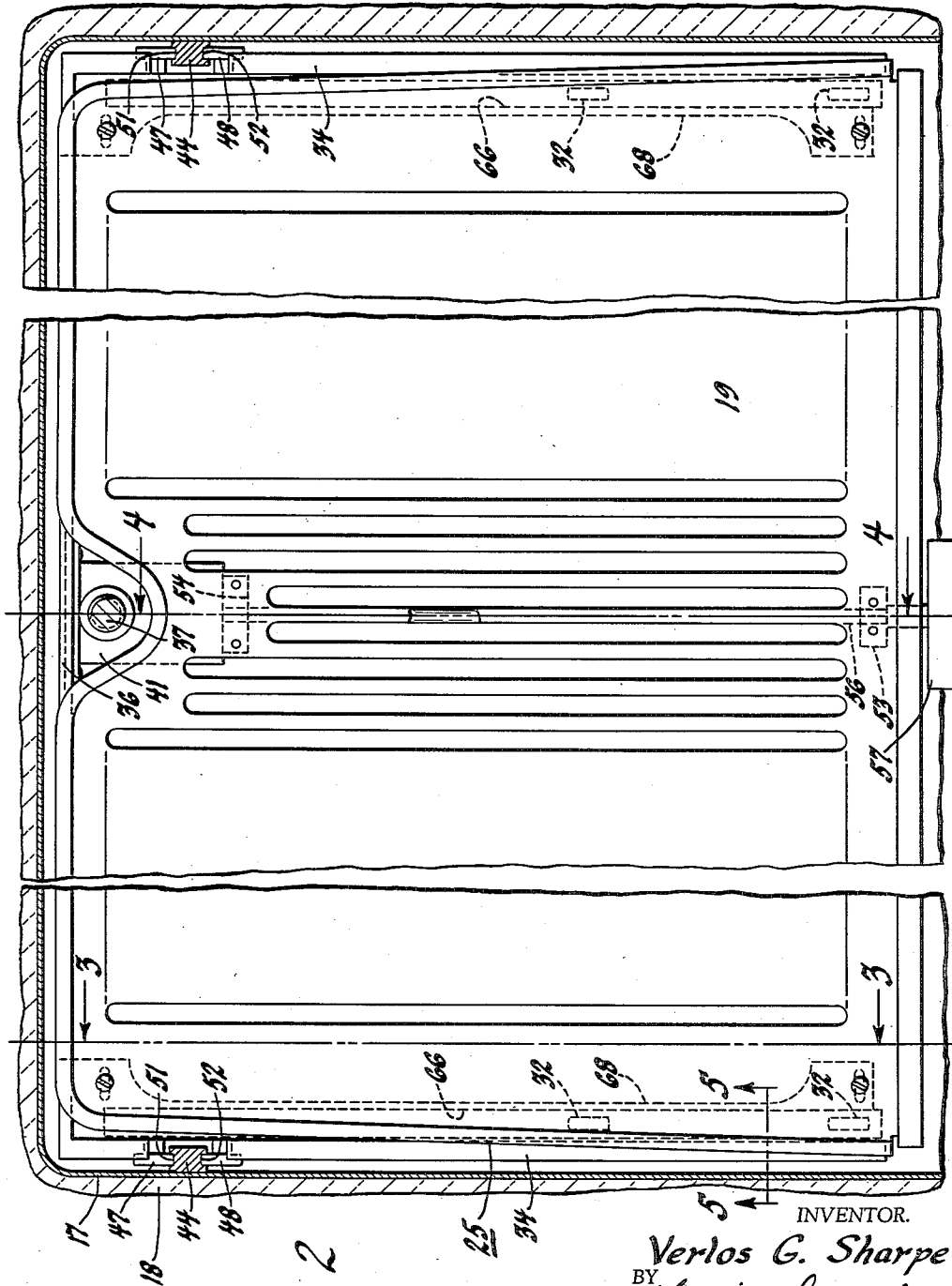


Fig. 2

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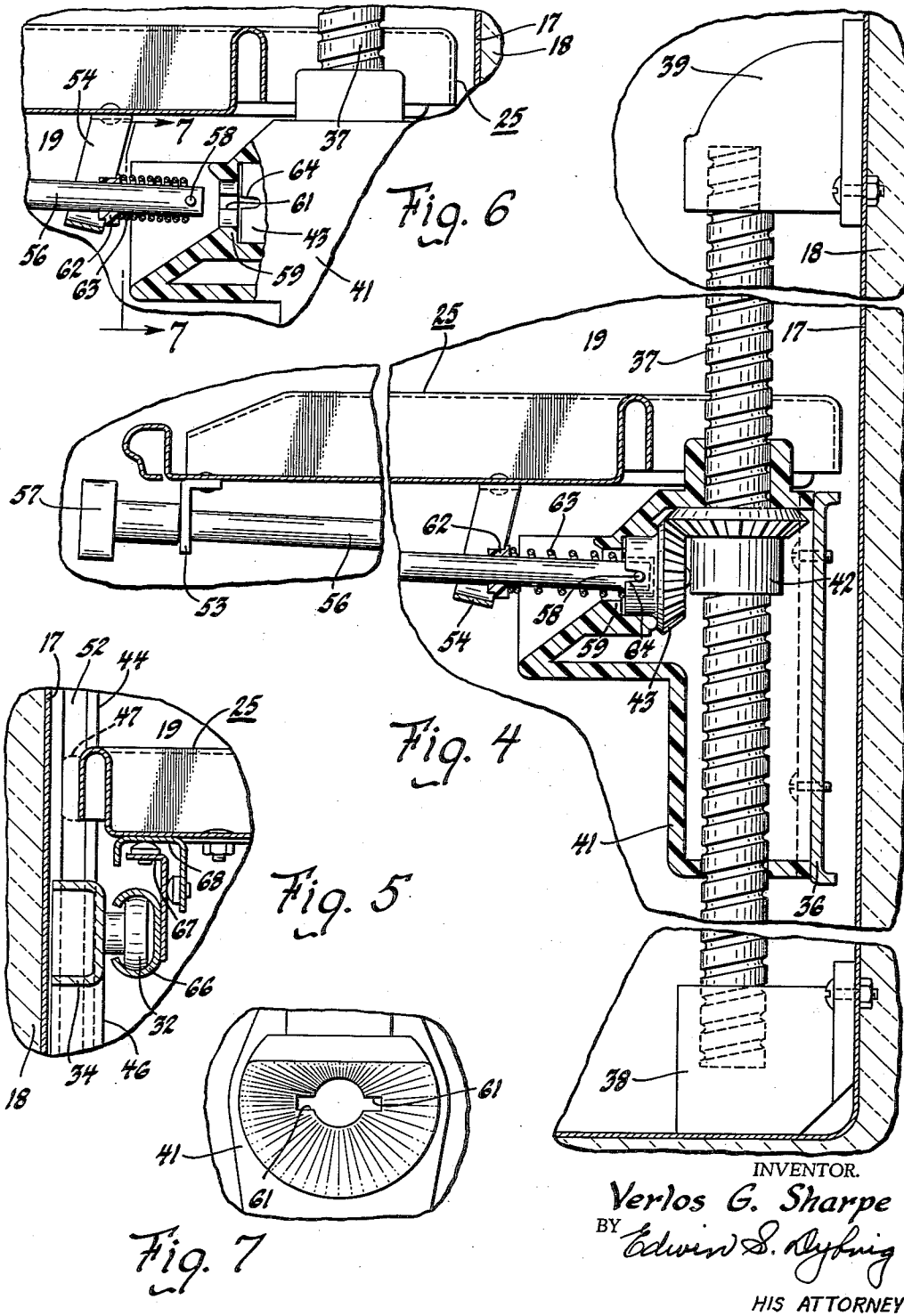
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3 Sheets-Sheet 3



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VERTICALLY ADJUSTABLE REFRIGERATOR SHELVES

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5 Claims. (Cl. 312—306)

This invention relates to refrigerators and particularly to a shelf arrangement in the food storage compartment thereof.

I am aware of the fact that others have provided vertically adjustable shelves in the food storage compartment of a refrigerator cabinet. However not a single arrangement known to me has been entirely satisfactory because it has not solved all the problems necessary to make vertically adjustable shelves feasible, relatively inexpensive and practical in use. A vertically adjustable shelf arrangement should include many features several of which are desired to be enumerated so that my invention will be better understood. A vertically adjustable shelf should be rollable or slidable part way out of a food compartment and must withstand a food load thereon, without bowing or bending, when moved outwardly of the compartment of between 40 and 45 pounds. A shelf must be easily adjustable vertically while supporting a full food load thereon. The vertical adjustment design should provide for adjustability of an individual shelf or a plurality of vertically adjustable shelves in a compartment independently of one another and the usable storage space in the compartment should not be reduced by the design. The range of vertically adjustable shelves should be maximum and not limited to predetermined increments of adjustment. A vertically adjustable shelf should be removable from a compartment without leaving a framework or other parts in a position within the compartment that will hinder food storage in the taller space provided by the removal of one of the shelves. The means for adjusting a shelf or shelves vertically in a compartment relative to one another must be simple to operate and readily accessible without necessitating removal of food products from a compartment so as to render the vertical adjustment as convenient as possible. Incorporation of all these and other features in a vertically adjustable shelf arrangement is difficult but I have, never-the-less, by my present disclosure provided various requirements of a specification for such arrangement in order to satisfy public demands.

An object of my invention is to provide an improved arrangement for adjusting shelves vertically relative to one another in a food storage compartment of a refrigerator cabinet having the features hereinbefore referred to incorporated therein.

Another object of my invention is to provide means whereby the user of a refrigerator cabinet can easily and quickly raise and/or lower the height of a shelf within the food storage compartment of the cabinet.

Another object of my invention is to support a plurality of shelves, of the type that are rollable or slidable outwardly and inwardly of a food compartment of a refrigerator cabinet through a front access opening therein, upon a means common to all of the plurality of shelves and to provide means for adjusting the height of a shelf in the compartment or for moving one shelf

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independently of another relative thereto vary the space therebetween.

A further object of my invention resides in the provision of a single jack-screw stationarily secured within the food storage compartment of a refrigerator cabinet adjacent one wall thereof which supports vertically spaced-apart cantilever bracket members each having a shelf mounted thereon and movable relative to the brackets outwardly and inwardly of the compartment and to rotatably connect nut means on the jack-screw to the brackets whereby operation of the nut means threads same upwardly and/or downwardly along the jack-screw to individually adjust or vary the height of the shelves relative to and independent of one another in the compartment.

In carrying out the foregoing objects it is a still further and more specific object of my invention to provide means adjacent the front of the vertically adjustable shelves operable to thread the nut means along the single jack-screw which means is slidable with the shelf and removable therewith from the refrigerator cabinet upon detachment of the shelf from a bracket upon which it is mounted.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Figure 1 is a front view of a household refrigerator cabinet having my shelf arrangement in the food storage compartment thereof and showing the compartment door in an open position;

Figure 2 is an enlarged broken fragmentary horizontal sectional view taken on the line 2—2 of Figure 1 of a vertically adjustable extensible shelf supported in the food compartment of the refrigerator;

Figure 3 is a broken vertical sectional view taken on the line 3—3 of Figure 2 showing a track means and rollers associated therewith in the food compartment for a vertically adjustable shelf;

Figure 4 is a broken fragmentary vertical sectional view taken on the line 4—4 of Figure 2 showing a nut means on a jack-screw and a connection thereto of a means for adjusting the height of a shelf in a compartment.

Figure 5 is an enlarged fragmentary sectional view taken on the line 5—5 of Figure 2 showing a side of one of the vertically adjustable shelves;

Figure 6 is a fragmental section similar to a part of Figure 4 showing a shaft of the shelf adjusting nut means disconnected from a gear and moved outwardly relative to a socket element; and

Figure 7 is a front view of the socket element shown in Figures 4 and 6 and is taken on the line 7—7 of Figure 6.

Referring to the drawings, for illustrating my invention, I show in Figure 1 thereof a household refrigerator cabinet of rectilinear configuration and comprising an outer shell or panel 16 and an inner metal liner 17 with any suitable or conventional insulating material 18 disposed therebetween (see Figures 2 and 3). The insulated wall structure forms or defines the top, bottom and upright back and side walls of a food storage compartment 19 within the refrigerator cabinet. Compartment 19 may be cooled by an evaporator of a closed refrigerating system (not shown) associated with the refrigerator cabinet. The evaporator of the refrigerating system is disposed behind a front cover or door 21 therefor in the upper portion of compartment 19 and the cooling effect produced by the evaporator chills and causes circulation of air throughout compartment 19 to preserve

food products stored therein. Food compartment 19 has an open front or front access opening normally closed by an insulated door structure 22, shown in open position in Figure 1, hingedly mounted on the refrigerator cabinet. A conventional stationary shelf 23 is mounted in the upper portion of compartment 19 and a plurality of spaced apart shelves, adjustable vertically within compartment 19, are supported beneath shelf 23. The adjustable shelves may be of the type which can be rolled and/or slid part way out of compartment 19 through its front opening when door 22 is opened. These adjustable, rollable or slidable shelves are generally represented by the reference numeral 25 and are constructed to be shifted outwardly of compartment 19 while being supported therein and detachable from the refrigerator cabinet preferably and substantially in accordance with the shelf arrangement disclosed and fully described in the Carl F. Petkowitz Patent #2,719,772 issued October 4, 1955, entitled Horizontally Movable Refrigerator Shelf, and assigned to the assignee of the present application. Since the shelves 25 are substantially like those in the Petkowitz patent the different positions of rolling and sliding a shelf outwardly of the food compartment 19 is not herein illustrated and reference may be had to this patent for such illustration. My improvement is particularly directed to adjusting the height of this type of shelf within compartment 19 and for this reason such a shiftable shelf may be of any suitable or desirable construction without departing from the spirit of the present invention. Shelves 23 and 25 are preferably formed from sheet metal and are reticulated in order to permit passage of air therethrough and around the interior of food storage compartment 19.

In accordance with this invention the shelves 25 should each, in order to increase the utility thereof and that of the refrigerator cabinet, be arranged for quick and easy adjustment by the user of the cabinet upwardly and/or downwardly relative to one another and independently of each other within the food compartment 19. To this end I locate a pair of horizontally aligned spaced apart rollers 32 adjacent each opposed upright side walls of compartment 19 near the open front thereof (see Figure 2). It is to be understood that the supporting means for each of the shelves 25 includes four of the rollers 32 along with other supporting structure to be hereinafter described. Each pair of rollers 32 are rotatably mounted upon studs 33 riveted or otherwise suitably secured to the forward end of legs 34 on cantilever bracket members 36 which are substantially U-shaped and extend along the upright back and side walls of compartment 19 in close proximity therewith. Means is provided for supporting the bracket members and consequently a shelf 25 mounted thereon within the compartment 19. This means includes or comprises a threaded shaft or upright jack-screw 37 stationarily secured in compartment 19 adjacent its one or back wall. Jack-screw 37 has its one end resting in a lower support element 38 and has its other end flattened and fitted in a flat sided or substantially D-shaped hole provided in an upper support element 39 (see Figure 4). The elements 38 and 39 are bolted or otherwise suitably fastened to the compartment rear wall and the fit of jack-screw 37 in element 39 prevents rotation thereof. A molded plastic or the like vertically elongated socket element 41 surrounding jack-screw 37 is secured to the central part of the bight portion of each of the U-shaped cantilever bracket members 36 and is adapted to be moved upwardly and/or downwardly along the jack-screw with the brackets 36 and consequently a shelf 25 mounted thereon. The central rear portion of each shelf 25 is formed to extend around the jack-screw 37. A pinion 42 (see Figure 4) threaded on jack-screw 37 is located in each of the movable socket elements 41 and is a part of the means by which a shelf 25 is rendered vertically adjustable while supported in compartment 19. A bevel

gear 43, also located in each of the movable socket elements 41, meshes with teeth provided on pinion 42. A vertical track means substantially in the form of an I-beam 44 is stationarily secured to the rear portion of each of the upright side walls of liner 17 of compartment 19 (see Figure 3). Cantilever bracket members 36 have an ear 46 depending from the rear part of the legs 34 thereof and upper and lower opposed rollers 47 and 48 respectively are mounted on studs 49 riveted or otherwise suitably secured to the ears 46. The one roller 48 is located at the lobe of ears 46 while the other roller 47 is located at the top of the anti-helix of the ears. These vertically offset rollers 47 and 48 ride in opposed tracks 51 and 52 on the beam 44 to center brackets 36 and consequently shelves 25 within compartment 19 and also serve to support a food load on the front portion of shelves 25. Each shelf 25 has a forward bracket 53 and a rear bracket 54 secured to its underside and a shaft 56 extends across shelf 25 and passes through these brackets so as to be carried by the shelf. It is to be noted that shaft 56 is disposed in substantially perpendicular relationship with respect to jack-screw 37. A short bar or handle 57 adjacent the front edge of shelf 25 (see Figures 1, 2 and 4) is keyed or locked to the forward end of shaft 56 and the rear end of the shaft has a pin 58 secured thereto with ends of this pin projecting laterally therefrom. A molded plastic collar or the like 62 surrounds shaft 56 and abuts against the rear bracket 54. A coil spring 63 also surrounds shaft 56 and is disposed or compressed between the projecting ends of pin 58 and collar 62 for a purpose to be hereinafter described. Bevel gear 43 is hollowed out or counter-bored axially thereof and provided with aligned slots 64 in the wall of the counter-bore which receive the projecting ends of pin 58 on shaft 56 to form a disconnectible joint between shaft 56 and gear 43. Socket element 41 has a hollowed out or counter-sunk forwardly directed open top cavity therein provided with a wall 59 between this cavity and gear 43. Wall 59 of socket 41 is provided with a hole for receiving shaft 56 and spring 63 thereon and this hole has opposed slots 61 cut in the wall thereof (see Figure 7) for the passage of projecting ends of pin 58 therethrough and into the slots 64 cut in gear 43 to serve a purpose to be hereinafter described. The pinions 42 form nut means in the present disclosure associated with each of the shelves 25 which nut means cooperate with the jack-screw 37 for individual adjustment of a shelf vertically therealong. Jack-screw 37 is of sufficient length to extend along the rear wall of compartment 19 continuously throughout the full range of vertical adjustment of the shelves 25. Gear 43 and shaft 56 provide means for operating the nut means or pinion 42 from the open front side of compartment 19 adjacent the forward edge of a shelf 25.

The C-shaped track member 66 and the track receiving portion or ear 67 thereon in the present disclosure (see Figure 5) correspond to these same elements in the patent hereinbefore referred to and remain in compartment 19 when a shelf 25 is detached from a cantilever bracket 36 and removed from the cabinet. In this disclosure the track portion 68, which rests on the track receiving ear 67, is a separate metal piece adjustably bolted or otherwise suitably secured to the bottom side of a shelf 25 instead of being formed integrally from the metal of a shelf as shown in the Petkowitz patent. It is to be noted that legs 34, track member 66 and the track piece or portion 68 lie in parallel relationship to the side walls of compartment 19 while the raised side edges of shelves 25 are angled slightly inward of the compartment side walls from front to back thereof (see Figure 2). This planular shape of a shelf 25 permits the shelf to clear the track means or beams 44 and facilitates removal of a shelf from a bracket member 36 to increase the height of a space in compartment 19 for the storage of large bulky food products if desired.

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Aside from the minor changes just described over the Petkowitz patented disclosure all the features set forth in this patent are incorporated in the present vertically adjustable shelving arrangement. In other words the shelves 25 in addition to being vertically adjustable are also rollable and slidable outwardly and inwardly of compartment 19 through its front access opening when door 22 of the refrigerator cabinet is opened while the shelves are supported from within the compartment. The shelves 25 are also detachable from the cantilever bracket members 36 and removable from the refrigerator cabinet as disclosed in the Petkowitz patent.

When it is desired to adjust a shelf 25 upwardly or downwardly relative to another shelf in compartment 19 to vary its height therein the cabinet door 22 is opened and the short bar handle 57, adjacent the front edge of a shelf, is rotated to revolve shaft 56 whereby the ends of pin 58, fitting in slots 64 of gear 43, rotates the gear 43 to thread the nut means or pinion 42 along jack-screw 37. Raising or lowering of a shelf 25 within compartment 19 depends upon the direction of rotation of handle 57 and shaft 56. The pinion or nut means 42 is rotatably connected to socket element 41 secured to cantilever bracket member 36 and consequently has a rotary connection with this bracket member and with a shelf 25 thereon. Upward and/or downward movement of shelf 25 causes the rollers 47 and 48 on ears 46 of legs 34 on the cantilever bracket member 36 to roll along the tracks 51 and 52 of the vertically extended track means 44. A shelf 25 may be raised or lowered in compartment 19 while containing a full load of food products and items of these products do not have to be shifted in order to gain access to the operating handle for adjusting the nut means. Since each shelf is provided with an individual adjustable nut means associated therewith and cooperating with the jack-screw 37 and since the single jack-screw extends continuously throughout the full range of adjustment of the plurality of shelves 25 any one shelf is movable to vary the height thereof within the compartment 19 independently of another shelf. It is to be understood that a shelf 25 can be extended outwardly of compartment 19 while handle 57 on shaft 56 is in a horizontal position to align the projecting ends of pin 58 with slots 61 in socket 41. When these elements are so aligned a forward pull on a shelf 25 will disconnect shaft 56 from gear 43 and permit this shaft to be removed forwardly of a socket 41 (see Figure 6) along with the shelf during rolling and sliding of same outwardly of compartment 19. As the extended shelf is pushed back into compartment 19 handle 57 is held in a horizontal position so that ends of pin 58 will pass through slots 61 in socket 41 and reenter the slots 64 in gear 43 for reconnecting the disconnectable joint between the nut means or pinion 42 and its operating or adjusting means.

Either of the shelves 25 can be detached from its supporting means or from its cantilever bracket member 36 and track members 66 while it is wholly within compartment 19 or when it is rolled part way out of same and prior to sliding the shelf an additional distance out of the compartment. In order to detach a shelf 25 from compartment 19 the bar handle 57 must be in a horizontal position and is then pulled forwardly of the front edge of the shelf, against the tension of spring 63, so as to further compress the spring and cause the projecting ends of pin 58 on shaft 56 to slide through the slots 61 in wall 59 of socket element 41 whereby the rear end of shaft 56 will be freed from the socket 41 (see Figure 6) and can be elevated out of the open top of the counter-sunk cavity thereof. Thereafter shelf 25, together with the shaft 56 and its operating handle 57, is lifted upwardly off the track members 66 and bracket member 36 whereupon it is removable from the refrigerator cabinet. The shaft 56 is also pulled forwardly of shelf 25 at the time of replacing the shelf into its supported position on

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a bracket member 36 whereafter the shaft is released and spring 63 forces the ends of pin 58 through slots 61 in socket 41 and into the slots 64 of gear 43 to thereby reconnect the operating means with the adjustable nut means or pinion 42.

From the foregoing it should be apparent that I have provided a novel and improved shelf arrangement for a refrigerator cabinet in which the shelves together with being rollable part way out of the food compartment thereof and then slidable an additional distance outwardly of same are also adjustable vertically within the compartment relative to one another. The shelves are firmly supported from within the food compartment during rolling, sliding and vertical movement thereof. The improved arrangement increases the utility of extensible shelving and of the refrigerator cabinet itself since any one shelf may be quickly and easily adjusted vertically without removing the same from the food compartment, without rotating a shelf in the compartment, without disassembling any parts of the structure and while food products are supported on the shelf. By extending the single jack-screw throughout the adjustable range of several shelves it serves to accommodate any desired number of vertically adjustable shelves within a compartment. My invention fulfills a number of desirable features required by public demand as hereinbefore described.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In a cabinet provided with walls defining a compartment therein, a plurality of vertically spaced apart shelves disposed one above the other in said compartment, means for adjustably supporting said shelves within said compartment, said means comprising a single upright jack-screw within said compartment adjacent one wall thereof, separate nut means associated with each of said plurality of spaced apart shelves and cooperating with said jack-screw for adjustment independently of one another therealong to vary the height of said shelves relative to each other in said compartment without rotating the shelves, and said single jack-screw extending continuously along said one compartment wall throughout the full range of adjustment of said plurality of shelves.

2. In a cabinet provided with walls defining a compartment therein, a plurality of vertically spaced apart shelves disposed one above the other in said compartment, means for adjustably supporting said shelves within said compartment, said means comprising a single upright jack-screw within said compartment adjacent one wall thereof, separate nut means associated with each of said plurality of spaced apart shelves and cooperating with said jack-screw for adjustment independently of one another therealong to vary the height of said shelves relative to each other in said compartment without rotating the shelves, said single jack-screw extending continuously along said one compartment wall throughout the full range of adjustment of said plurality of shelves, and means incorporated in each of said shelf supporting means for moving a shelf laterally with respect to said jack-screw outwardly of compartment.

3. In a cabinet provided with walls defining a compartment therein, a plurality of vertically spaced apart shelves disposed one above the other in said compartment, means for adjustably supporting said shelves within said compartment, said means comprising a single upright jack-screw stationarily secured within said compartment adjacent the rear wall thereof, separate nut means cooperating with said jack-screw, a bracket member on each of said separate nut means cooperating with said jack-screw, a bracket member on each of said separate nut means having portions thereof extending outwardly from opposite sides of said jack-screw toward opposed side walls of said compartment, said bracket members each

carrying one of said shelves thereon, said separate nut means being adjustable independently of each other upwardly and/or downwardly along said stationary jack-screw for moving a bracket member and varying the height of a shelf carried thereon relative to another shelf in said compartment, and said single stationary jack-screw extending continuously along said compartment rear wall throughout the full range of adjustment of said plurality of shelves.

4. The combination defined by claim 3 wherein ends of the outwardly extending portions of the bracket members are guided by track and roller means disposed adjacent the opposed compartment side walls during adjustment of a shelf.

5. In a cabinet provided with walls defining a compartment therein, a plurality of vertically spaced apart shelves disposed one above the other in said compartment, means for adjustably supporting said shelves within said compartment, said means comprising a single upright jack-screw stationarily secured within said compartment adjacent the rear wall thereof, separate nut means cooperating with said jack-screw, a bracket member on each of said separate nut means cooperating with said jack-screw, a bracket member on each of said separate nut means having portions thereof extending

outwardly from opposite sides of said jack-screw toward opposed side walls of said compartment, said bracket members each carrying one of said shelves thereon, said separate nut means being adjustable independently of each other upwardly and/or downwardly along said stationary jack-screw for moving a bracket member and varying the height of a shelf carried thereon relative to another shelf in said compartment, said single stationary jack-screw extending continuously along said compartment rear wall throughout the full range of adjustment of said plurality of shelves, and means interposed between a bracket member and a shelf carried thereon for moving the shelf laterally with respect to its carrying bracket a predetermined distance outwardly of said compartment.

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