May 8, 1962 C. H. WURTZ ET AL 3,033,636

REFRIGERATOR SHELVING

Filed Dec. 19, 1960 3 Sheets-Sheet 1

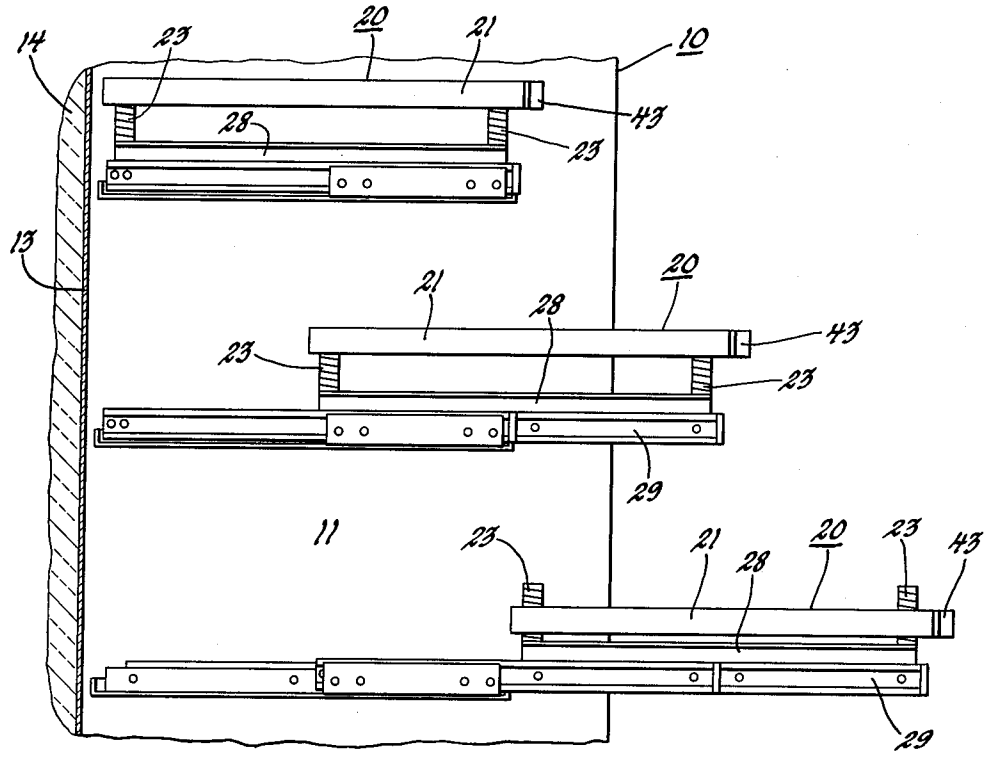

Fig. 2

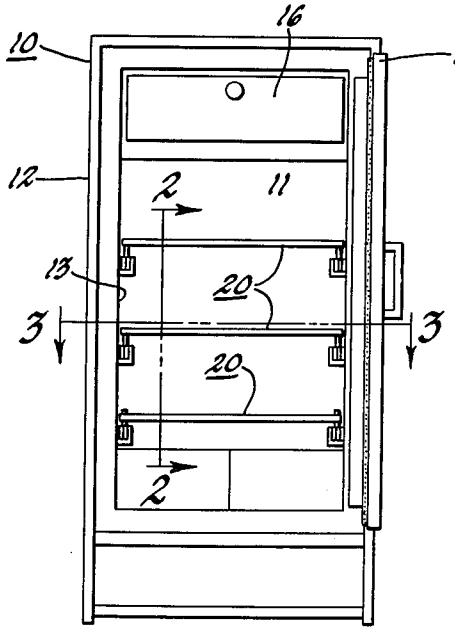

Fig. 1

INVENTORS
Clifford H. Wurtz
Everett C. Armentrout
BY Lloyd M. Keighley
THEIR ATTORNEY

May 8, 1962 C. H. WURTZ ET AL 3,033,636

REFRIGERATOR SHELVING

Filed Dec. 19, 1960 3 Sheets-Sheet 2

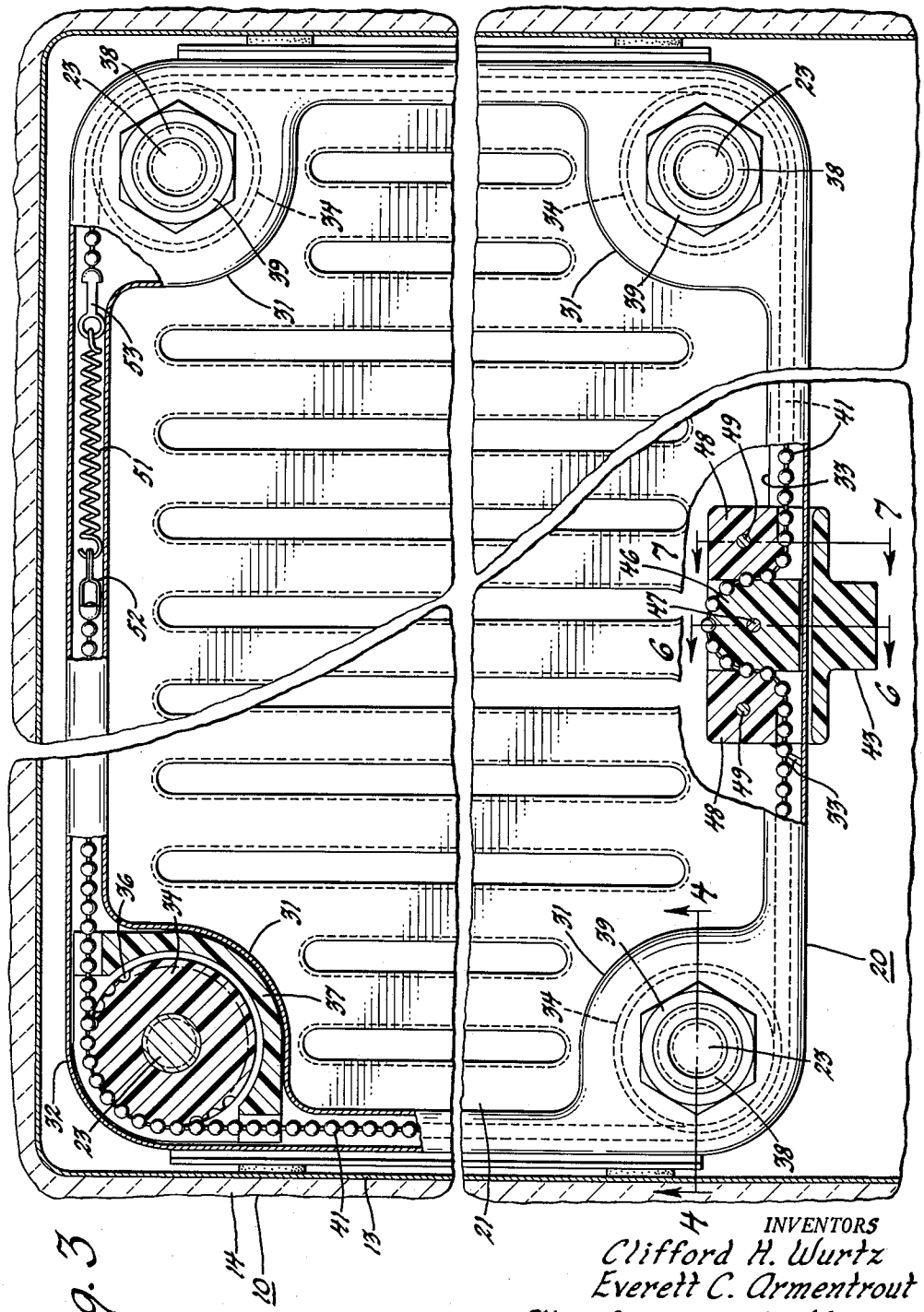

Fig. 3

INVENTORS
Clifford H. Wurtz
Everett C. Armentrout
BY Lloyd M. Keighley
THEIR ATTORNEY

May 8, 1962 C. H. WURTZ ET AL 3,033,636

REFRIGERATOR SHELVING

Filed Dec. 19, 1960 3 Sheets-Sheet 3

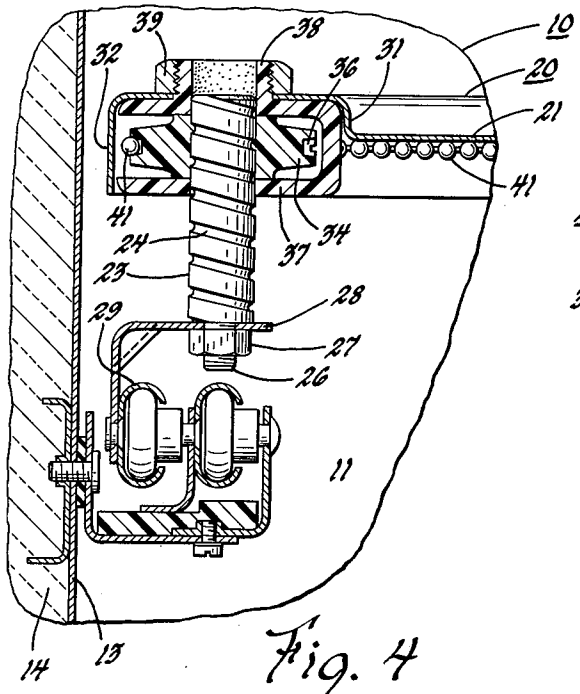

Fig. 4

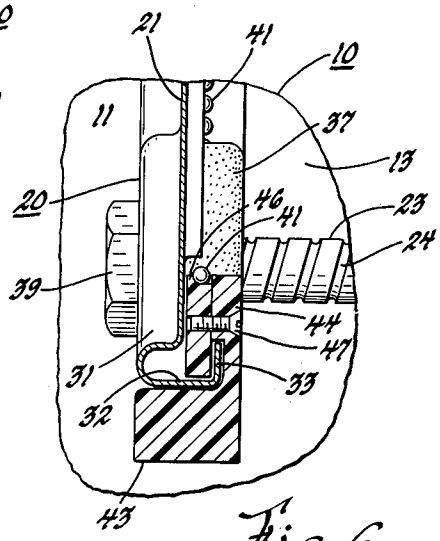

Fig. 6

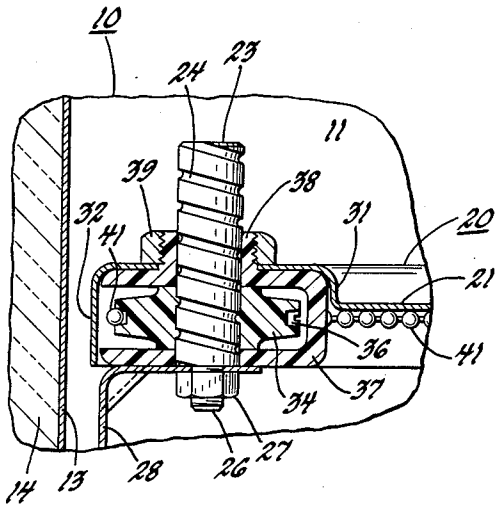

Fig. 5

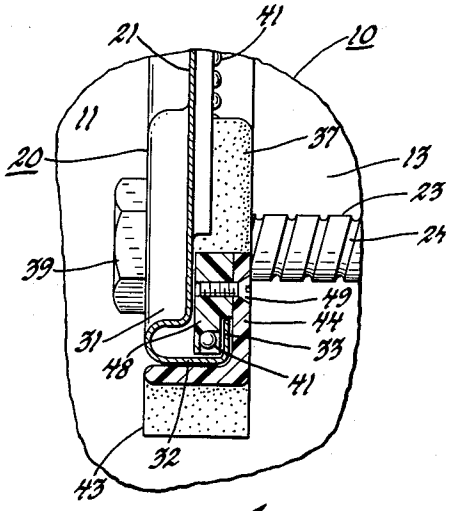

Fig. 7

INVENTORS
Clifford H. Wurtz
Everett C. Armentrout
BY Lloyd M. Keighley.
THEIR ATTORNEY

United States Patent Office 3,033,636
Patented May 8, 1962

3,033,636

REFRIGERATOR SHELVING

Clifford H. Wurtz, Dayton, and Everett C. Armentrout, New Carlisle, Ohio, assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Dec. 19, 1960, Ser. No. 76,784
11 Claims. (Cl. 312—298)

This invention relates to cabinets, and particularly, to a shelf or article support arranged in a food storage chamber of a refrigerator cabinet.

Others have provided vertically adjustable shelves in the food storage compartment of a refrigerator cabinet but to our knowledge these prior arrangements have not been entirely satisfactory because they would not solve all the problems to render vertically adjustable shelves feasible and practical in use. A vertically adjustable shelf arrangement should include many features several of which are desired to be enumerated in order that our invention will be better understood.

A vertically adjustable shelf must, as of present-day usage of refrigerator cabinets, be glidable outwardly of the food storage chamber of the refrigerator while supported therein and capable of withstanding a food load thereon, without bowing or bending, when moved part way out of the chamber of between forty and fifty pounds. A shelf must be easily adjustable by a housewife while supporting a full food load thereon. The vertical adjustment should provide for adjustability of an individual shelf or a plurality of shelfs in a refrigerator independent of one another and the usable storage space in the refrigerated chamber of the refrigerator must not be materially reduced by the design. A vertical adjusting means for a refrigerator cabinet shelf should also be designed to avoid the necessity of forming cavities or indentations in walls of a food storage chamber in the cabinet which presents obstacles to the cleaning of such chamber walls. The range of vertically adjustable shelves should be divisible so that increments of adjustment thereof are available. Means for adjusting a shelf or shelves vertically in a chamber relative to one another must be readily accessible in the front of a refrigerator cabinet. Moreover, rollable or glidable shelves should be vertically adjustable independent of gliding movement thereof while a shelf is located entirely within a chamber of a refrigerator cabinet and/or when the shelf is moved into a position part way out of the chamber. Incorporation of all these features in a glidable vertically adjustable shelf arrangement has been difficult but we have, nevertheless, by our present disclosure accomplished the requirements for such an arrangement so as to fully satisfy public demands of users.

An object of our invention is to provide an improved arrangement for adjusting shelves vertically relative to one another and to their supporting means in a food storage chamber of a refrigerator cabinet having features above referred to incorporated therein.

Another object of our 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 a food storage chamber of the cabinet uniformly throughout the extent of the shelf so as to avoid tipping of food products thereon or the falling of food products from the shelf.

A further object of our invention is to mount a plurality of shelves or shelf devices of the type that are individually glidable outwardly and inwardly of a food storage chamber of a refrigerator cabinet through a front access opening therein and to provide adjustable means for each shelf for separately varying their height in the chamber either while a shelf is positioned within the chamber or when the shelf is glided into a position part way outwardly thereof.

In carrying out the foregoing objects it is a still further object of our invention to mount a shelf device within a food storage chamber of a refrigerator cabinet for horizontal reciprocation with respect thereto and to provide adjustable means positioned between the shelf device and another device cooperating therewith and supporting same which includes an endless belt-like or substantially endless beaded chain element shiftable relative to the shelf and to the supporting device therefor that is operable at the front of the shelf independently of gliding movement thereof or of a reciprocated or glided position of the shelf for uniformly raising and/or lowering all portions of the shelf irrespective of its location while attached to the cabinet.

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 embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a front view of a household refrigerator cabinet having our invention embodied in the food storage chamber thereof and showing the chamber door in open position;

FIGURE 2 is an enlarged fragmentary vertical sectional view taken along the line 2—2 of FIGURE 1 showing extensible shelf supporting devices for a plurality of shelf devices in different extended positions relative to one another;

FIGURE 3 is an enlarged fragmentary broken horizontal sectional view taken along the line 3—3 of FIGURE 1 showing breaks in different portions of the shelf to illustrate various parts of a means associated therewith for adjusting the height thereof;

FIGURE 4 is a fragmentary vertical sectional view taken along the line 4—4 of FIGURE 3 showing a threaded shaft and a cogwheel thereon of the shelf adjusting means with the shelf supported in an uppermost elevated position on its extensible device;

FIGURE 5 is a view similar to FIGURE 4 with the shelf supported in its lowermost lowered position;

FIGURE 6 is a fragmentary vertical sectional view taken along the line 6—6 of FIGURE 3 showing parts of a chain actuator of the adjusting means associated with the shelf; and

FIGURE 7 is another fragmentary vertical sectional view through a different portion of the chain actuator and taken along the line 7—7 of FIGURE 3.

Referring to the drawings, for illustrating our invention, we show in FIGURE 1 thereof a household refrigerator **10** having walls providing a cabinet of rectilinear configuration and defining a rectangular food storage chamber **11** therein. Cabinet **10** comprises an outer shell or panels **12** and an inner metal liner **13** with suitable insulating material **14** disposed between the liner and the cabinet outer shell (see FIGURES 2 and 3). Liner **13** forms walls of the food storage chamber **11** within cabinet **10** the interior of which may be cooled to a low food preserving temperature by a refrigerant evaporator located in the upper portion of the chamber and preferably shaped to provide a freezing compartment therein closed by a closure member **16** as is conventional in the refrigeration art. The refrigerant evaporator located behind member **16** forms a part of a closed refrigerating system associated with cabinet **10** and has conduit or pipe connections with a refrigerant translating device of any suitable or conventional design such as a motor-compressor-condenser unit (not shown) usually mounted in a machine compartment below the insulated food storage chamber **11**. Suitable controls for the refrigerant translating device and for admitting refrigerant to the evaporator may be provided to maintain a

predetermined temperature within the food storage chamber 11. A door 18, shown in open position in FIGURE 1, normally closes an opening in the front upright wall of cabinet 10 which affords access to the interior of chamber 11. The food storage chamber is provided with a plurality of vertically spaced-apart shelves or shelf devices, generally represented by the reference character 20 in FIGURE 1, which are located on spaced-apart opposed extensible devices or means supported from a support device or means rigidly secured to opposite upright side walls of chamber 11. The shelf supporting means or devices and the extensible means or devices for each shelf may, insofar as our invention is concerned, be of any suitable character to permit gliding movement of a shelf device outwardly of chamber 11 or away from and back into the chamber at the front of cabinet 10 while supported from within this chamber. For example, the extensible device and the support device of each shelf device preferably includes horizontally movable roller and track guide means and stationarily mounted rollers respectively of a type substantially as shown and described in detail in the patent to O. V. Saunders, 2,724,639, dated November 22, 1955. Reference is made to said Saunders patent so as to reduce descriptive matter herein since such structures are now well known to those skilled in the art. The shelf receiving projections on the extensible track of shelf support and the method or manner of supporting a shelf thereon are slightly modified by us from that shown in the Saunders patent just identified in order to accomplish the objects and advantages of this invention.

In the present disclosure and with reference to FIGURES 3 through 7 of the drawings thereof it is to be noted that we provide adjustable means interposed between the reticulated sheet metal shelf proper 21 of a shelf device 20 and the shelf support device adapted to vary the height of a shelf 21. While this adjustable means is shown in a particular location in the present disclosure it is to be understood that the same may, without departing from the realm of our invention, be located intermediate the shelf extensible device and the supporting device therefor rigidly secured to walls of chamber 11 of cabinet 10 in which case the extensible device would be elevated and/or lowered simultaneously with a shelf relative to the support or supporting device in such a mounting arrangement. In either event, a shelf device or shelf proper 21 is disposed within the food storage chamber 11 for gliding movement in a straight line direction outwardly thereof and back thereinto while mounted upon walls of the chamber. The adjustable means herein employed for changing the height of a movable shelf 21 independently of its gliding movement comprises four spaced-apart upright shafts 23 (see FIGURE 3) threaded as at 24 and provided with a reduced threaded lower end portion 26 which is rigidly mounted by bolts or the like 27 upon a shelf receiving projection 28 on the track or movable part 29 of the extensible means of device 20 (see FIGURE 4). Each of the four shafts 23 are mounted so as to register with a shaft receiving hole provided adjacent each corner of shelf 21. Sheet metal shelf 21 is provided, in addition to the air circulating apertures therein with upwardly directed stamped or embossed corner portions 31 and a down turned flange 32 which forms with an upwardly directed part of the shelf a bounding rim of substantially an inverted U-shape in cross-sectional contour. One leg of the inverted U-shaped bounding rim along the forward edge of the shelf only is bent inwardly as at 33 for purposes to be hereinafter described. The shelf adjusting means also comprises four nut members or cogwheels 34, one of which is located in each of the corner sockets of shelf 21 provided by the embossations 31. Each nut member or cogwheel 34 is threaded upon the threads of shafts 23 and is provided with cogs or teeth 36 along its periphery. These members are preferably nonmetallic and formed of molded plastic material. A substantial portion of each nut member or cogwheel 34 is enclosed by walls of a nonmetallic housing 37 having an externally threaded integral bushing part 38 projecting therefrom through the shaft receiving hole in the raised or embossed corner portions 31 on shelf 21 (see FIGURE 3). A nut 39 is threaded upon the threads of part 38 of each of the four housings 37 and these nuts 39 bear against shelf 21 to thereby secure the housing thereto for rotatably interlocking the nut members or cogwheels to the shelf at the four corners thereof. The shelf adjusting means further comprises or includes a substantially endless belt-like element or beaded chain means 41 which extends around sides of shelf 21 and is looped around or over each nut or cogwheel 34. Beads on the beaded chain 41 mesh with teeth or cogs 36 on nut members or wheels 34 and the chain is movable relative to shelf 21 irrespective of the position thereof for driving or rotating the members or cogwheels 34 vertically along the threads or shafts 23. The adjusting means for shelf 21 further comprises an actuator for the belt-like element or beaded chain means. This actuator includes a nonmetallic preferably molded plastic finger grip part 43 having a base portion 44 underlying the inwardly bent part 33 of the bounding rim extending along the front of shelf 21 and provided with an upstanding lug 46 (see FIGURE 3) which is secured to part 43 after it is slidably associated with the shelf front by a screw or bolt 47. Side pieces 48 are thereafter secured to part 43 of the actuator by screws or bolts 49. Lug 46 and both side pieces 48 are provided with suitable teeth or cogs so as to each receive beads on the belt or beaded chain for clamping them therebetween against slippage relative thereto. When parts 43, 46 and 48 of the actuator are assembled and secured together, they lock the actuator to chain 41 against relative movement and the interlocking of the actuator at the front edge portion of self 21 renders the actuator slidable therealong for shifting the chain. The end portions or junctures of the inwardly bent front part or lip 33 at opposite sides of shelf 21, where this lip merges with the depending lower part of flange 32, form stops for the chain actuator to control its sliding distance and regulate the vertical distance of rotation of wheels 34 along shafts 23. It will be noted by reference to FIGURE 3 of the drawings that a coil spring 51 is interposed in the connection between ends 52 and 53 of chain 41. This coil spring keeps beads on chain 41 in mesh with the teeth or cogs 36 on the four nut members or cogwheels 34 and also maintains the chain looped therearound taut. Sliding of the chain actuator along a shelf device shifts chain 41 to rotate members or wheels 34 in unison about shafts 23 for varying the height of shelf 21 with respect to the extensible track and roller device. It will be noted that the elevation and cooperation of the various movable or shiftable parts of the adjusting means for shelf 21 locates belt-like or chain element 41 above the bottom of flange 32 on the shelf within its inverted U-shaped bounding rim to thereby conceal this element from view at the top and front of the shelf when door 18 on cabinet 10 is opened.

In FIGURE 2 of the drawings, the uppermost shelf 21 of a shelf device 20 is illustrated as being wholly within the food storage chamber 11 of refrigerator cabinet 10. The shelf 21 on the next lower set of opposed extensible supporting devices is in a position glided or extended part way out of chamber 11 and the shelf 21 on the lowermost of the devices 20 is glided or moved substantially entirely outward of the chamber. This is a feature which is highly desired by housewives in present-day refrigerators as it facilitates placing food products upon the shelves, removing same therefrom and rearranging the food products on different ones of the shelves. Since our shelf device adjusting means is operable independently of gliding movement of a shelf 21, it is actuatable at all times regardless of a slided position of the shelf and this feature

is of great importance. For example, a housewife may desire to vertically adjust or vary the height of a shelf while it is located wholly within the food storage chamber **11** of refrigerator cabinet **10** and when the shelf is glided into a position part way out of the chamber, or when same is glided into a position substantially entirely outward thereof. In order to change the height of a shelf device **21** by the adjusting means herein disclosed, one merely opens door **18** of cabinet **10** and grasps the finger grip portion **43** of the actuator at the front of a shelf and slides the actuator, which is normally at one side of chamber **11**, to the right as viewed in FIGURE 3 of the drawings along the shelf forward bounding edge to shift chain **41** relative thereto for rotating the nut members or cogwheels **34** about shafts **23** in unison. The rotation of members or wheels **34** threads them upwardly and/or downwardly along shafts **23** whereby all portions of a shelf **21** are simultaneously and uniformly elevated or lowered with respect to another shelf on the devices **20**, or within chamber **11**. As before stated, this vertical adjustment to vary the height of a shelf **21** can be carried out independently of gliding movement of the shelves and while a shelf is located in any one of the glided positions thereof shown in FIGURE 2 of the drawings. Consequently, our present disclosure is distinguished from, has advantages and produces new results over shelf adjusting devices which are dependent for adjustment in response to sliding movements of a shelf since we eliminate such necessity and provide vertical adjustment of a shelf of refrigerator cabinet shelf devices irrespective of the position of the shelf relative to the interior of the food storage chamber while the shelf is supported therefrom. Our invention combines two highly desirable demanded features and constitutes an improvement in the art as now known to us. These features are obtained by different and separate operations and, therefore, the utility of a shelf device as herein disclosed is greatly increased, particularly in the use thereof within a refrigerator cabinet. By arranging elements of a shelf adjustable means at corners of shelf devices as herein disclosed, usable storage space intermediate shelves is not wasted since objects like bowls or goblets may be placed on a shelf adjacent its corners so as to extend or project over elements of the adjusting means thereat.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, a cabinet having a plurality of walls defining a chamber therein provided with an access opening in one of the cabinet upright walls, a four-cornered reticulated sheet metal shelf in said chamber occupying a horizontal cross-sectional area thereof, said shelf being provided with a down turned bounding rim, extensible means supporting said shelf within said chamber for gliding movement outwardly thereof through the chamber access opening while supported on said supporting means, adjustable means interposed between said shelf and its supporting means adapted to vary the height of the shelf relative thereto, said adjustable means comprising four spaced-apart upright threaded shafts each located adjacent a corner of said shelf and stationarily mounted on a movable part of said extensible supporting means, a cogwheel threaded upon the threads on each shaft and rotatably interlocked to said shelf for causing said outward movement thereof with said part of said supporting means, a beaded chain having its ends connected together looped around each wheel extending along sides of said shelf and an actuator for said chain rigidly secured to beads thereof and slidably interlocked with the forward portion of said bounding rim on the shelf, said chain being shiftable with respect to said shelf independently of gliding movement thereof while the shelf is positioned within said chamber and when the shelf is glided into a position part way of the chamber, and sliding of said actuator along said forward portion of the bounding rim on said shelf shifting said chain to rotate said wheels in unison on said shafts for raising and/or lowering the shelf.

2. The combination defined by claim 1 wherein the chain is within peripheral sides of the shelf and is substantially concealed by the bounding rim thereon.

3. The combination defined by claim 1 wherein a coil spring is interposed in the connection between ends of the chain for maintaining said chain taut on the cogwheels.

4. In combination, a cabinet having a plurality of walls defining a chamber therein provided with an access opening in one of the cabinet upright walls, a shelf in said chamber occupying a horizontal cross-sectional area thereof, extensible means supporting said shelf within said chamber for gliding movement outwardly thereof through the chamber access opening while supported on said supporting means, adjustable means interposed between said shelf and its supporting means adapted to vary the height of the shelf relative thereto, said adjustable means comprising spaced upright threaded shafts disposed at opposite sides of said shelf and stationarily mounted on a movable part of said extensible supporting means, a member threaded upon the threads on each shaft and rotatably interlocked to said shelf for causing said outward movement thereof with said part of said supporting means and an endless belt-like element extending transversely across said shelf intermediate said members and looped around each member for rotating them, said belt-like element being shiftable with respect to said shelf independently of gliding movement thereof while the shelf is positioned within said chamber and when the shelf is glided into a position part way out of the chamber, and shifting of said endless belt-like element rotating said members in unison for raising and/or lowering said shelf.

5. The combination defined by claim 4 wherein the shelf is fabricated of sheet metal and provided with a down turned rim concealing the belt-like element.

6. In combination, a cabinet having a plurality of walls defining a chamber therein provided with an access opening in one of the cabinet upright walls, a shelf in said chamber occupying a horizontal cross-sectional area thereof, extensible means supporting said shelf within said chamber for gliding movement outwardly thereof through the chamber access opening while supported on said supporting means, adjustable means interposed between said shelf and its supporting means adapted to vary the height of the shelf relative thereto, said adjustable means comprising spaced upright threaded shafts disposed at opposite sides of said shelf and stationarily mounted on a movable part of said extensible supporting means, a cogwheel threaded upon the threads on each shaft and rotatably interlocked to said shelf for causing said outward movement thereof with said part of said supporting means and a beaded chain having its ends connected together and looped around each wheel with its beads drivingly meshing with cogs on said wheels, said chain extending transversely across said shelf and being shiftable with respect thereto independently of gliding movement thereof while the shelf is positioned within said chamber and when the shelf is glided into a position part way out of the chamber, and shifting of said chain rotating said wheels in unison for raising and/or lowering said shelf.

7. The combination defined by claim 6 wherein the shelf is fabricated of sheet metal and provided with a down turned rim concealing the chain.

8. The combination defined by claim 6 wherein a coil spring is interposed in the connection between ends of the chain for maintaining said chain taut on the cogwheels.

9. In combination, a cabinet having a plurality of walls defining a chamber therein provided with an access opening in one of the cabinet upright walls, a shelf in said chamber occupying a horizontal cross-sectional area thereof, extensible means supporting said shelf within chamber for gliding movement outwardly thereof through the chamber access opening while supported on said support-

ing means, adjustable means interposed between said shelf and its supporting means adapted to vary the height of the shelf relative thereto, said adjustable means comprising four spaced-apart upright threaded shafts each located adjacent a corner of said shelf and stationarily mounted on a movable part of said extensible supporting means, a member threaded upon the threads on each shaft and rotatably interlocked to said shelf for causing said outward movement thereof with said part of said supporting means and a belt-like element having its ends connected together and looped around said members for driving them in unison, said belt-like element being shiftable with respect to said shelf independently of gliding movement thereof while the shelf is positioned within said chamber and when the shelf is glided into a position part way out of the chamber, and shifting of said belt-like element rotating said members for raising and/or lowering said shelf.

10. The combination defined by claim 9 wherein a coil spring is interposed in the connection between ends of the belt-like element for maintaining said element taut on the rotatable members.

11. In combination, a cabinet having a plurality of walls defining a chamber therein provided with an access opening in an upright wall thereof, a shelf occupying a horizontal cross-sectional area of said chamber, extensible means supporting said shelf within said chamber for gliding movement outwardly thereof through the chamber access opening while supported on said supporting means, adjustable means interposed between said shelf and its supporting means to vary the height of the shelf relative thereto, said adjustable means comprising spaced-apart upright threaded shafts mounted on a movable part of said extensible supporting means, a member threaded upon the threads of each shaft and an endless belt-like element intermediate said members looped therearound for rotating them, said members having a connection with said shelf for causing said outward gliding movement thereof with said movable part of said supporting means, at least one of said members being rotatably interlocked to said shelf for moving same vertically therewith, said belt-like element being shiftable with respect to said shelf independently of gliding movement thereof while the shelf is positioned within said chamber and when the shelf is moved into a position part way out of the chamber, and the shifting of said element rotating said members whereby said one member raises and/or lowers the shelf through its interlock therewith.

References Cited in the file of this patent

UNITED STATES PATENTS

732,367	Melville	June 30, 1903
1,851,183	Hill	Mar. 29, 1932
2,268,800	Butzien	Jan. 6, 1942
2,805,479	Droste	Sept. 10, 1957
2,861,695	Carbary	Nov. 25, 1958

FOREIGN PATENTS

476,977	Great Britain	Dec. 20, 1937