

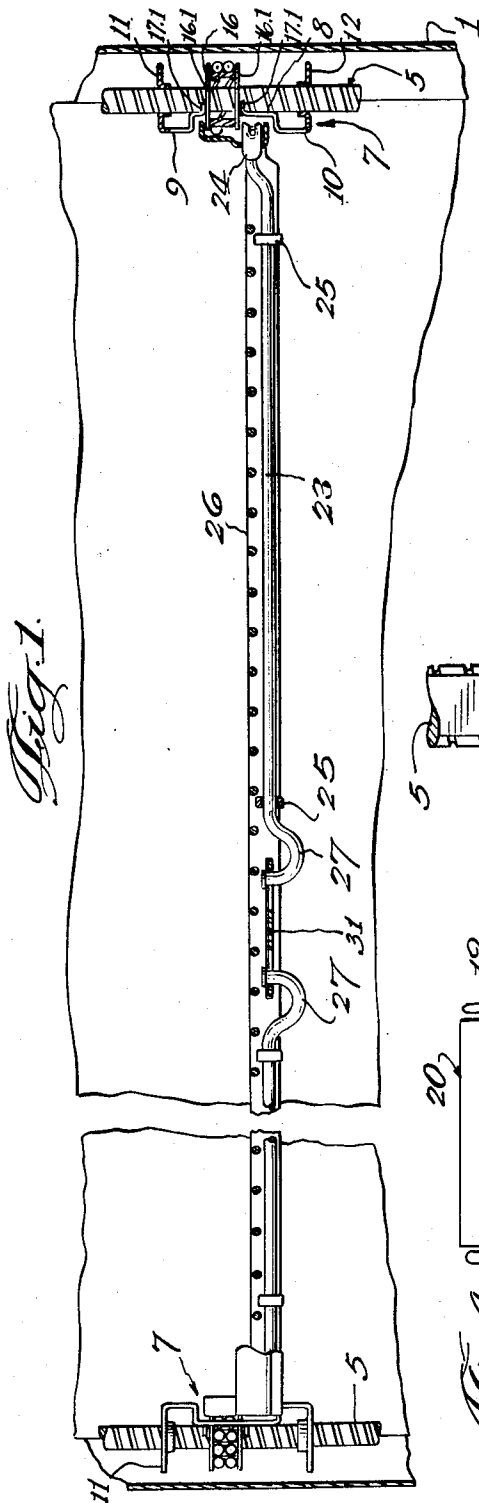
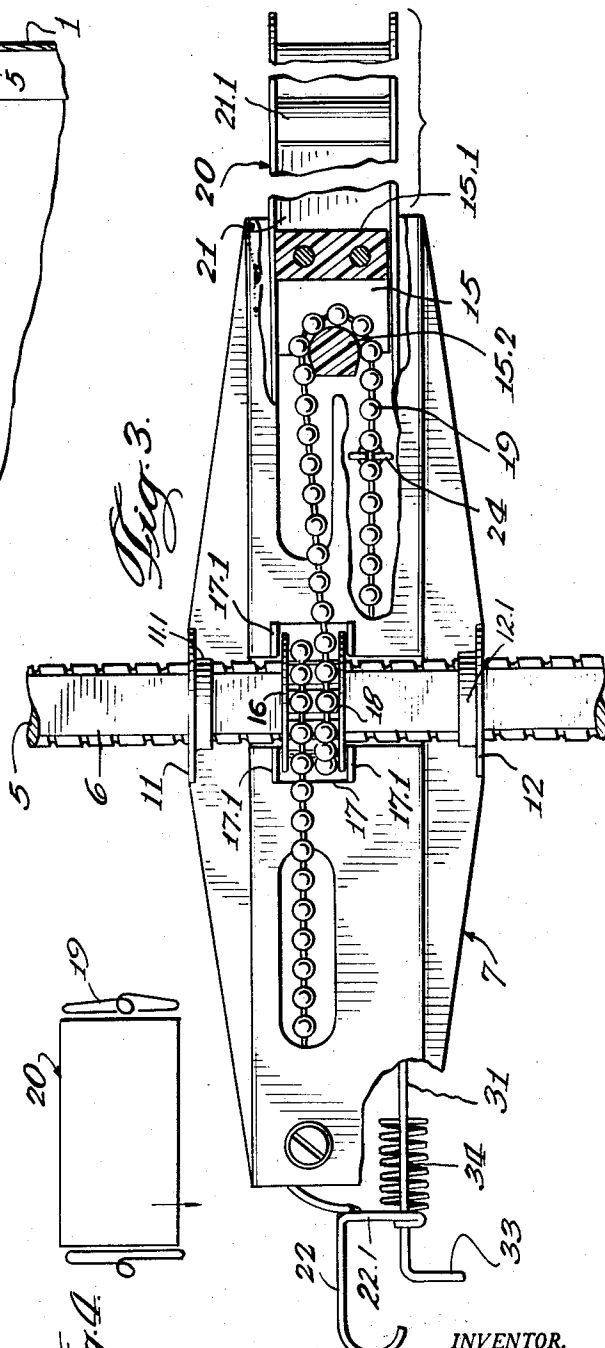
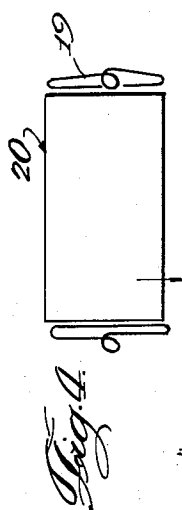
Nov. 25, 1958

R. J. CARBARY
VERTICALLY ADJUSTABLE AND Laterally
SLIDABLE SHELF STRUCTURE

2,861,695

Filed Aug. 25, 1955

3 Sheets-Sheet 1



INVENTOR.
Richard J. Carbary
BY *Andrew L. Schubert*
attorney

Nov. 25, 1958

R. J. CARBARY
VERTICALLY ADJUSTABLE AND LATERALLY
SLIDABLE SHELF STRUCTURE

2,861,695

Filed Aug. 25, 1955

3 Sheets-Sheet 2

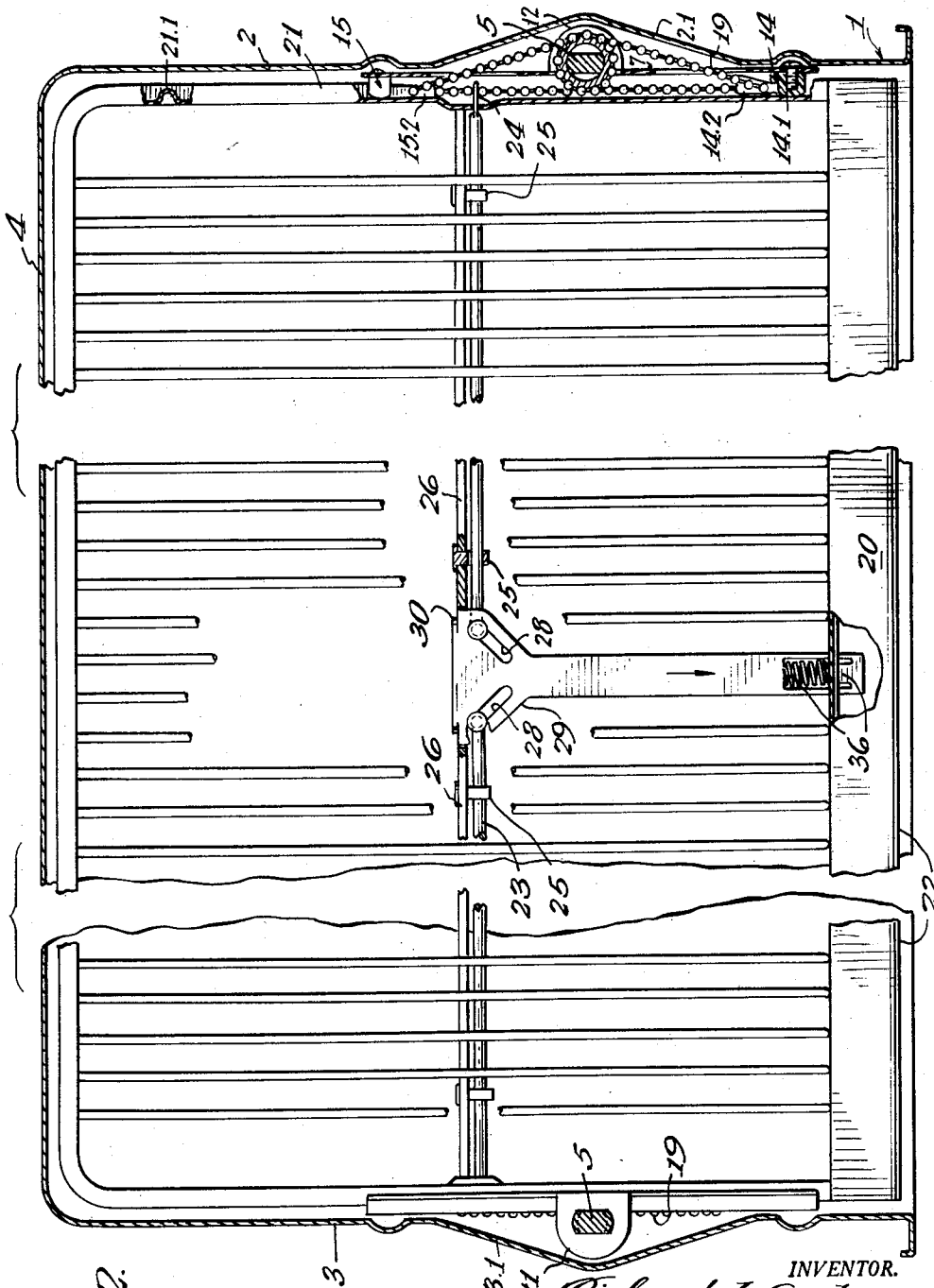


Fig. 2.

INVENTOR.
Richard J. Carbary
BY
Andrew H. Hubbard
Attorney

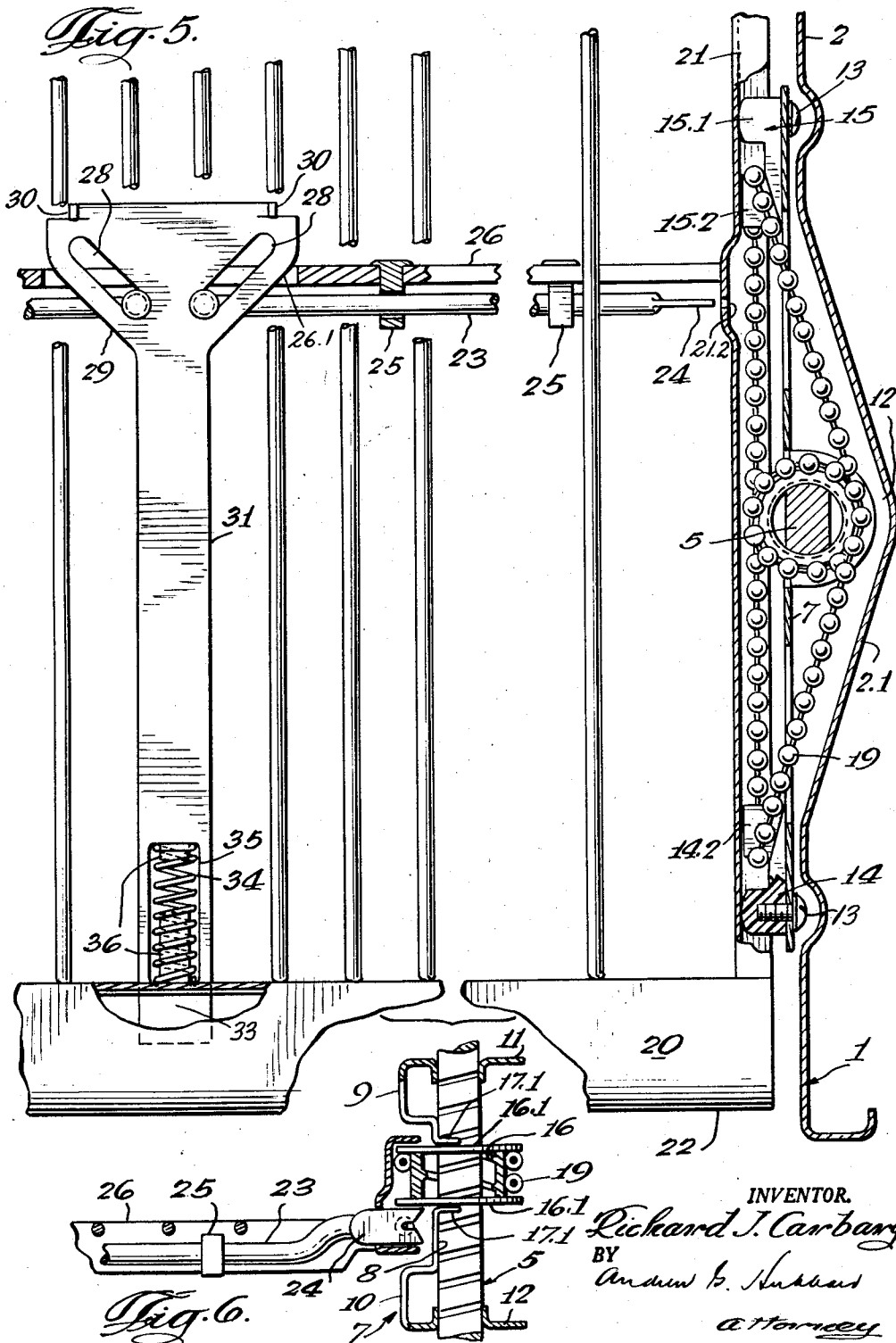
Nov. 25, 1958

R. J. CARBARY
VERTICALLY ADJUSTABLE AND LATERALLY
SLIDABLE SHELF STRUCTURE

2,861,695

Filed Aug. 25, 1955

3 Sheets-Sheet 3



2,861,695

VERTICALLY ADJUSTABLE AND Laterally SLIDABLE SHELF STRUCTURE

Richard J. Carbary, La Grange, Ill., assignor to General Electric Company, a corporation of New York

Application August 25, 1955, Serial No. 530,508

7 Claims. (Cl. 211-143)

This invention relates to vertically adjustable and laterally slidable shelf structures, and, in particular, to a shelf structure in which the lateral movement of the shelf may automatically effect the vertical adjustment of the shelf.

Although shelf structures embodying my invention are not limited to any particular environment, their ease of operation and capacity for almost infinite vertical adjustment make them very useful in domestic refrigerators in which it is almost a requisite for commercial success to provide sliding shelves to facilitate access to items occupying the rear areas of the shelves, and easily vertically adjustable shelves to increase or decrease the vertical space between the shelves of the refrigerator. There are, of course, numerous examples of sliding shelf constructions in the art, but vertical adjustments are usually accomplished by means of fixed ladder supports which require the shelf to be completely removed from the refrigerator and reinserted at the new level. Usually, such an operation requires that the shelf be cleared of its contents before it is removed from the refrigerator. The removal of the items and the replacement of them on the shelf when the shelf is in its adjusted position are not only bothersome tasks but require the refrigerator door to be open for a substantial period of time.

It is an object of the present invention to provide a cabinet shelf adjustment means in which the shelf may be adjusted vertically in either direction merely by the lateral movement of the shelf as it is partially withdrawn from the cabinet and returned thereto.

It is another object of the invention to provide a slidable and vertically adjustable shelf in which vertical adjustment may or may not result from the sliding movement of the shelf at the option of the user.

It is a further object of the invention to provide a slidable and vertically adjustable shelf in which the shelf is capable of an almost infinite number of vertical adjustments.

It is yet another object of the invention to provide a slidable and vertically adjustable shelf which may be withdrawn from its support means to any extent up to a predetermined maximum and in which the extent to which the shelf is withdrawn may establish the degree of vertical adjustment.

It is still a further object of the invention to provide a slidable and vertically adjustable shelf in which it is not necessary to remove any of the articles from the shelf to effect the vertical adjustment thereof.

It is yet another object of the invention to provide a slidable and vertically adjustable shelf having a simple finger control by which the user may if desired utilize the sliding movement of the shelf to effect the vertical adjustment thereof.

These and other objectives may be accomplished in presently preferred embodiment by utilizing a pair of fixed vertical standards or supports spaced apart slightly more than the width of the shelf. The standards have

a similar screw-threading throughout the vertical extent thereof representing the desired limits of vertical shelf adjustment. Associated with each of the standards so as to be slidable thereon is a shelf guide which slidably receives a side edge of the shelf. The respective guides are supported on the standards by a nut screw-threadedly engaging the standard and mechanically associated with the guides so that the nuts comprise the vertical supports for the guides. Such mechanical association also insures that when a nut is rotated in one or another direction and thus travels along the standard, the associated guide is constrained to follow. Means are provided to cause the sliding movement of the shelf to rotate each of the nuts an equal amount, whereby to effect uniform vertical movement of the shelf guides and thereon-carried shelf, or optionally to make such sliding movement ineffective to rotate either of the nuts, whereupon the shelf would remain in its established position. Said means includes a finger-operated device which translates the sliding movement of the shelf into rotation of the nut. It will be obvious that with proper use of the last-named device, the nut may be rotated during a movement of the shelf outwardly of the standards or during the return movement of the shelf toward the standards, whereupon the direction and extent of rotation of the nut and corresponding direction and extent of vertical travel of the shelf along the standards may be established.

Other features and objectives will be apparent from the following detailed description of presently preferred embodiments of the invention, read in connection with the accompanying drawings in which:

Fig. 1 is a front elevation, partly in section, of a portion of a cabinet and the supporting standards showing the shelf guides and with the nut actuating means in engaged position;

Fig. 2 is a partial plan view showing the shelf and associated guide means, portions of the shelf and of one of the guide means having been broken away to reveal underlying structure;

Fig. 3 is a fragmentary side elevation of one of the shelf guide means and associated shelf and supporting standard with portions of the shelf guide means having been broken away to reveal underlying structure;

Fig. 4 is a schematic plan view showing the relationship of the nut-actuating means to the nuts on the respective sides of the shelf.

Fig. 5 is a fragmentary plan section of the shelf and guide means, with the nut actuator disengaged; and

Fig. 6 is a fragmentary front elevation, showing the nut actuator engaged.

Referring now to Figs. 1 and 2, my improved shelf structure is illustrated in a cabinet 1, which may, for example, be what is known in the art as the "inner liner" of a refrigerator cabinet, the outer walls of which are not shown. The cabinet or liner 1 includes side walls 2, 3, rear wall 4, and top and bottom walls (not shown). A conventional door (not shown) will be provided as a front closure. Except for the angular side wall bulges 2.1 and 3.1 which extend the full height of the cabinet or liner 1, the liner is conventional.

Vertical standards or columns 5 are disposed at each side of the cabinet within the respective side wall bulges; said columns are rigidly secured to the upper and lower cabinet walls or other supports by flanges or the like (not shown). The respective columns may advantageously comprise flattened cylindrical rods and each is identically screw-threaded with a cut screw of suitable pitch. As shown best in Figs. 1 and 3, the screw formation provides substantial smooth area 6 along which the shelf guide structures may smoothly slide, as presently explained.

3

A shelf guide 7 is carried by each column. The shelf guides are advantageously formed of relatively heavy stamped metal and are essentially channel shape for rigidity. As appears in Fig. 6, the respective shelf guides comprise a central web portion 8 arranged to bear against a flattened side wall of the associated column and upper and lower web portions 9, 10, respectively, formed with the tabs 11, 12, which, as best shown in Fig. 6, embrace the column 5. Each said tab includes a suitable sleeve portion (see 11.4 and 12.1, Fig. 3) for slidably engaging said column. It will be obvious that the engagement of the web 8 and the tabs 11 and 12 with the flat side of the column 5, secures each guide 7 against rotation on the column and that the wide spacing of the tabs 11 and 12, best shown in Fig. 3, offers support of the guide against undesirable tilting.

The guides are provided with guide blocks 14, 15 at the ends thereof. Said guide blocks act as shelf bearings and may be molded of nylon or the like, or fabricated as metal bearing elements. As shown, the guide blocks have rounded end portions respectively identified as 14.1 and 15.1 and rounded chain guides 14.2 and 15.2. The blocks 14 and 15 are firmly secured to the web 8 as by suitable screws 13, or equivalent.

A cylindrical nut 16 is operatively associated with each column 5 and is loosely confined within the web 8 of the associated guide 7. Conveniently, the association may be established and maintained by having the nut occupy an opening 17 in the web 8; the upper and lower walls of said opening include tabs 17.1 which extend over the upper and lower flanges 16.1 of the nut 16. Means for rotating the nut on the column 5 comprise the sprocket teeth 18 formed on the cylindrical barrel of the nut and an endless chain 19 of the "bead chain" variety, looped twice about the barrel in engagement with the sprocket teeth and passed over the chain guides 14.2 and 15.2. As best shown in Fig. 2, a substantial length of said chain extends parallel to the flange 8 of the associated guide block. The sprocket teeth and associated chain may be termed the "nut actuator," because it is obvious that drawing on the chain 19 in either horizontal direction will rotate the nut 16 and cause it to traverse the column 5 in accordance with the direction of rotation. It will be obvious also that the travel of the nut will cause the travel of the guide 7 therewith. It is desirable that the columns 5, guides 7, and nuts 16 be identical to reduce manufacturing and inventory problems. This is possible if the chains 19 are looped about the sprocket teeth in the fashion indicated in Fig. 4, whereby the movement of the chains 19 in the same direction will produce the proper rotation of the associated nuts to insure uniform direction and extent of travel along the columns 5.

The respective guides 7 are for the express purpose of guiding the sliding movement of an associated shelf in a plane normal to the columns 5 and, as earlier stated, the sliding movement of the shelf may optionally be used to raise or lower the guides 7 on the associated columns. As best shown in Figs. 2 and 3, the shelf 20 is a simple adaptation of the conventional refrigerator shelf. A channel rim 21 extends along each side and across the rear of the shelf. The depth of the channel, as shown in Fig. 3, smoothly receives the portions 14.1 and 15.1 of the guide blocks which therefore provide spaced bearings along which the shelf may be slid. The front rim 22 is applied as a handle or hand-grip portion. A suitable stop 21.1 within each side channel limits the extent of movement of shelf 20 outwardly of the columns 5.

Means are provided to engage the chain 19 by an element carried by the shelf, in order to move the chain during any desired portion or direction of movement of the shelf. For example as shown in Fig. 2, the chain engaging devices comprise rods 23 extending from substantially the center of the shelf to each side thereof,

4

at which point each of the rods terminates in a flattened fork 24, slidably passing through a slot 21.2 in the side channel 21. The forked portions 24 are vertical to the plane of the shelf and will fit between the beads of the adjacent chain when the rods are extended, as presently described. Each of the rods 23 is slidably mounted in studs 25 fixed to a central element 26 of the shelf below the surface thereof. Each rod terminates in an upwardly facing end portion 27 which enters a cam slot 28 formed in a cam plate 29 extending through a guide slot 26.1 in the shelf element 26. The cam slot comprises two equal branches sloping equally outwardly toward the rear, as viewed in Fig. 2. Ears 30 struck from the plate 29 serve as stops to limit the sliding movement of the cam plate forwardly of the shelf, as viewed in Fig. 2. The cam plate is attached to, or may be integral with, a flat slide arm 31 which extends slidably through leg portion 22.1 of the shelf front 22 as indicated in Fig. 3. Said slide arm terminates in a hook 33 (Fig. 3) below said front 22. A return spring 34 disposed in an opening 35 in the arm 31 and held herein by tongues 36 or the like, biases the arm for movement rearwardly of the shelf, as viewed in Fig. 5.

When the arm 31 and cam plate 29 occupy their normal position, the rods 23 will each have been operated inwardly of the side walls of the shelf 20 by the action of the associated cam slot 28. Such inward movement disengages the forked portions 24 from the adjacent bead chain. In this situation, the shelf 20 may be freely drawn forwardly of, and returned to, the columns 5 without in any way affecting the position of the shelf guides 7, for it is obvious that such shelf movement will be without effect on the chains 19 which therefore remain stationary.

However, if it is desired to vertically adjust the shelf 20 on the columns 5, the operator grasps the fingerpiece 33 of the slide arm 31 and draws the slide arm outwardly which causes the cam plate 29 to extend the two rods 23, so that the forked ends 24 thereof engage the chain 19, as shown in Fig. 2. When the shelf is thereupon drawn forwardly of the columns 5, the chain 19 will be caused to move in a fashion rotating the respective nuts 16. This will cause a vertical movement of the shelf guides and the associated shelf along the column 5. The direction and extent of such movement depends of course on the pitch and direction of the screw thread of the column 5. If the initial sliding movement of the shelf does not produce the desired extent of vertical adjustment, the operator releases the arm 31, permitting spring 34 to return the cam plate to its home position in which the rods are withdrawn from the chains 19, and slides the shelf inwardly of the cabinet. This inward movement is without effect on the shelf guides 7 because the respective chains 19 are stationary. Then by again drawing outwardly on the arm 31 to cause cam plate 29 again to extend the rods 23, the chains are again engaged and another slidable outward displacement of the shelf 20 will produce another vertical displacement of the shelf guides and associated shelf. This can be repeated as often as necessary; and of course a relatively fine vertical adjustment may be accomplished by withdrawing the shelf only partially and then releasing the arm 31 so that the chains 19 become disengaged. The shelf may be returned to home position within the cabinet without, of course, further affecting the vertical adjustment thereof.

It will be obvious that if the shelf adjustment is to be made in the reverse direction, the operator need only to withdraw the shelf 20 to its permitted limit before actuating the arm 31 to extend the rods 23, whereupon the return movement of the shelf will rotate the nut in the opposite direction and effect the opposite vertical travel of the shelf guides and shelf.

While there has been described what is at present considered to be the preferred embodiment of the invention,

it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

I claim:

1. A vertically adjustable and laterally slidable shelf structure, comprising fixed, vertical, screw-threaded support means, shelf guide means carried by said vertical support means for slidable vertical travel thereon, said guide means including a nut in screw-threaded relation with said support means to effect vertical travel of said guide means along said support means according to the direction of rotation of said nut, a shelf carried by said guide means for sliding movement thereon in either of two directions normal to said support means, actuator mechanism engaging said nut and disposed between said shelf and said nut for rotating said nut in one or another direction according to the direction of horizontal movement of said shelf, and means carried by said shelf to selectively effect the operation of said actuator mechanism and associated nut in a direction determined solely by the direction of horizontal movement of said shelf relative to said nut.

2. A vertically adjustable and laterally slidable shelf, comprising fixed, vertical, screw-threaded support means, shelf guide means including a nut in screw-threaded relation with said support means to effect vertical travel of said guide means along said support means according to the direction of rotation of said nut, means including an endless chain engaging with said nut for rotating said nut, a shelf structure carried by said guide means for sliding movement normal to said support means, means for mechanically connecting said shelf structure to said nut rotating chain to effect rotation of said nut upon sliding said shelf, said means including a bar member movable into or out of engagement with said chain, and means for optionally moving said bar member into or out of such engagement, whereby the sliding movement of said shelf may or may not be used to rotate said nut, at the decision of the operator.

3. A vertically adjustable and laterally slidable shelf according to claim 2, in which said chain is of the bead chain variety, and said bar member has a forked end portion which engages said chain between successive beads.

4. A vertically adjustable and laterally slidable shelf structure, comprising fixed, vertical, screw-threaded support means, shelf guide means carried by said support means for slidable vertical travel thereon, said guide means including a nut in screw-threaded relation with said support means to effect vertical travel of said guide means along said support means according to the direction of rotation of said nut, a shelf carried by said guide means for sliding movement normal to said support means, actuating means for rotating said nut in one or another direction according to the direction of sliding movement of said shelf, said actuating means including a toothed portion on said nut, and an endless chain engaging said nut and arranged in said guide means with a portion of said chain extending in proximity to said shelf in the direction of sliding movement of said shelf, a fork member movably mounted on said shelf, manually operable means for moving said fork member into engagement with said chain to cause movement of said chain relative to said nut upon sliding movement of said shelf, whereby to effect rotation of said nut, and means for establishing a normal position of said fork member out of engagement with said chain to permit sliding movement of said shelf independent of said nut actuator.

5. A vertically adjustable and laterally slidable shelf structure, comprising horizontally spaced and mutually

aligned non-circular vertical columns having a continuous screw thread, a shelf guide for each of said columns, each of said guides including a channel member slidably secured to the associated column in right angular relationship therewith, means including vertically spaced sleeve members extending from said channel member about said standard to maintain said shelf guide against undesirable tilting relative to said column, a nut rotatably mounted within each said channel in screw-threaded association with said column, sprocket means on said nut, a continuous chain in permanent engagement with said sprocket, means to effect rotation of said nut on said column upon movement of said chain relative to said column, means for guiding said chain for movement over a fixed path within said channel member, a shelf slidably carried by and between the respective channel members for sliding movement in either of two directions normal to said column, said directions being parallel to a portion of said chain, means on said shelf to grip said chain to enforce movement thereof during movement of said shelf, and means for optionally actuating said chain gripping means to grip or release said chain.

6. A vertically adjustable and laterally slidable shelf structure, comprising fixed, vertical, support means, shelf guide means carried by said support means for slidable vertical travel thereon, a shelf carried by said guide means for horizontal sliding movement thereon in either of two directions relative to said support means in a plane normal thereto, shelf guide positioning means rotatably held by said guide means in engagement with said support means to raise or lower said guide means according to the direction of rotation of said positioning means, mechanism for rotating said positioning means, and means carried by said shelf and engageable with said mechanism to operate the same for rotating said positioning means in a desired direction solely by a sliding movement of said shelf.

7. A vertically adjustable and laterally slidable shelf structure, comprising fixed, vertical, screw-threaded support means, a nut on said support means, shelf guide means carried by said vertical support means for slidable travel thereon, said shelf guide means rotatably confining said nut whereby rotation of said nut will effect vertical displacement of said shelf guide means according to the direction of rotation of said nut, said shelf guide means, further, having a horizontally disposed guide member, a shelf slidably carried in said guide member for movement toward or away from said support means, nut actuator mechanism including an elongated member carried by said shelf guide means for horizontal movement relative to said nut and means for drivingly connecting said member to said nut, whereby horizontal movement of said actuator member effects rotation of said nut in a direction established by the direction of horizontal movement of said member relative thereto, means mounted on said shelf for mechanically connecting said shelf to said actuator member for movement of said member by horizontal sliding movement of said shelf in said guide member, and means for optionally connecting or disconnecting said shelf-mounted means and said actuator member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,421,012	Koepsell	June 27, 1922
1,777,529	Neldner	Oct. 7, 1930
2,066,303	Schulz	Dec. 29, 1936
2,182,003	Roark	Dec. 5, 1939
2,564,831	Butkus	Aug. 21, 1951
2,609,267	Hallock	Sept. 2, 1952