April 3, 1934. O. M. OTTE 1,953,688

SLIDING SHELF FOR REFRIGERATORS

Filed July 24, 1931 3 Sheets-Sheet 1

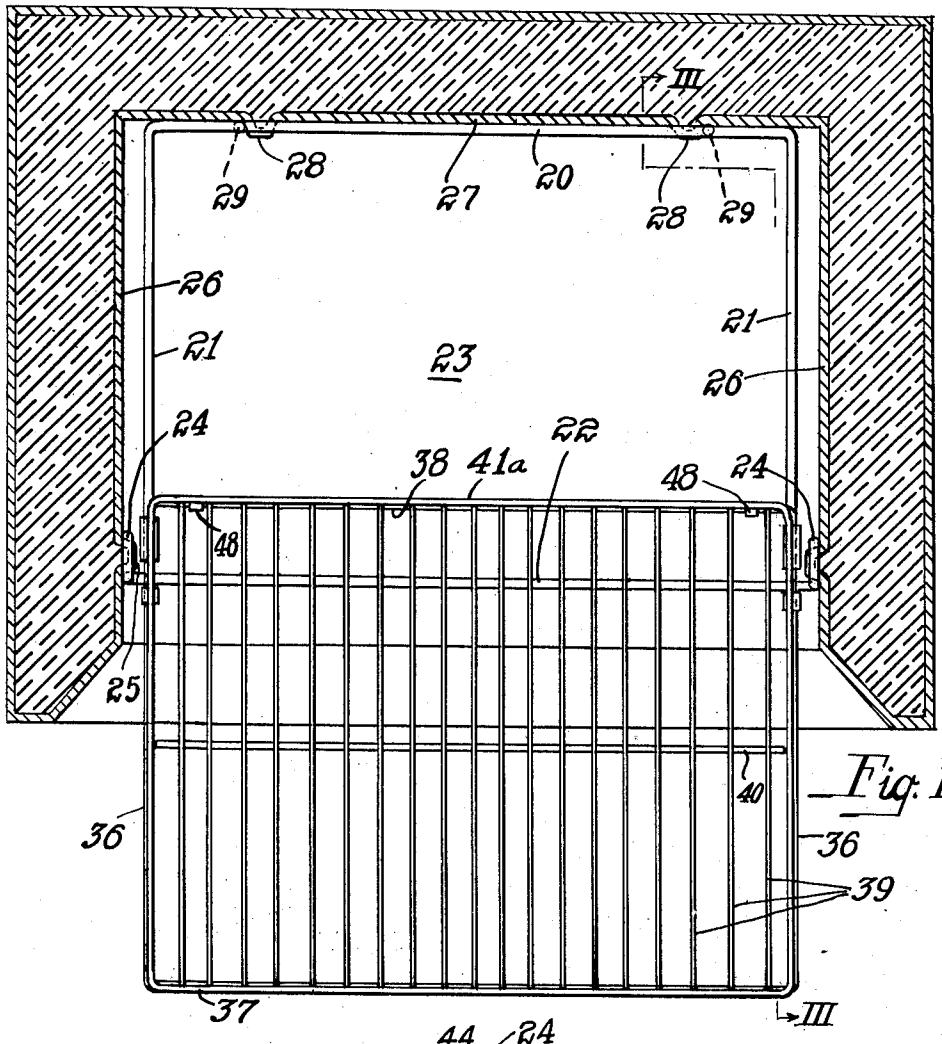


Fig. 1.

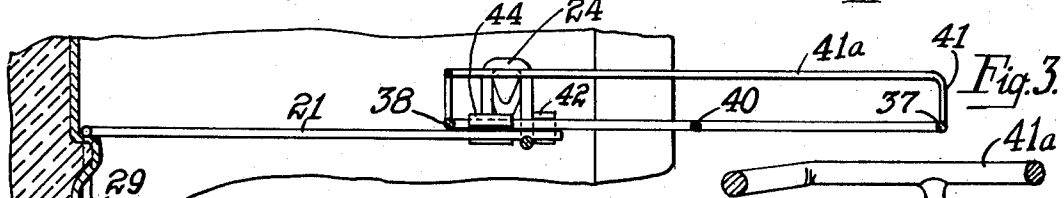


Fig. 3.

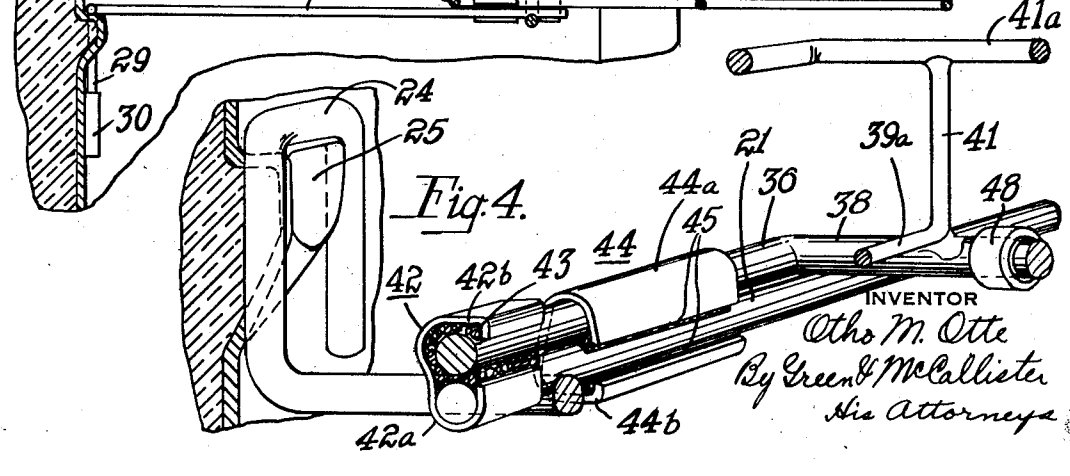


Fig. 4.

INVENTOR
Otho M. Otte
By Green & McCallister
His Attorneys

April 3, 1934. O. M. OTTE 1,953,688

SLIDING SHELF FOR REFRIGERATORS

Filed July 24, 1931 3 Sheets-Sheet 2

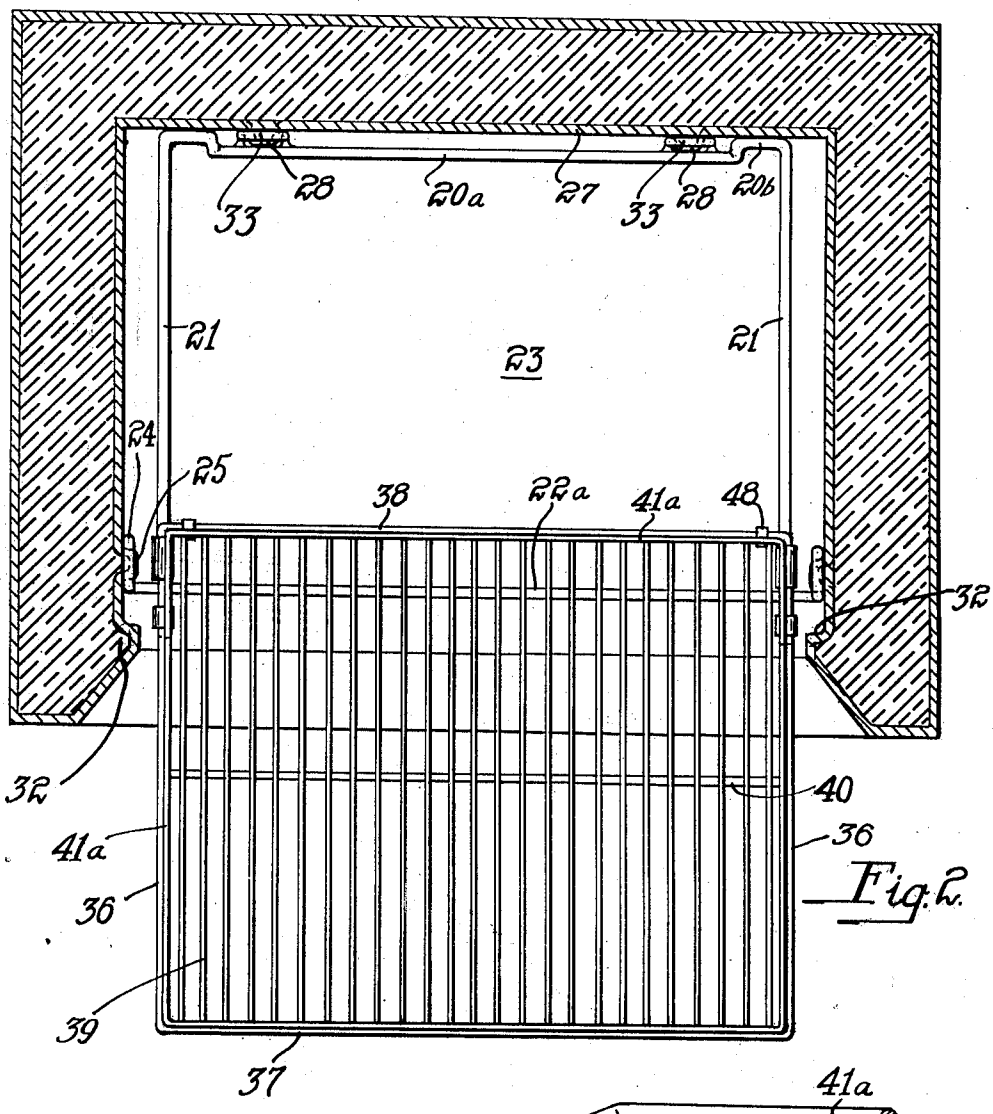


Fig. 2.

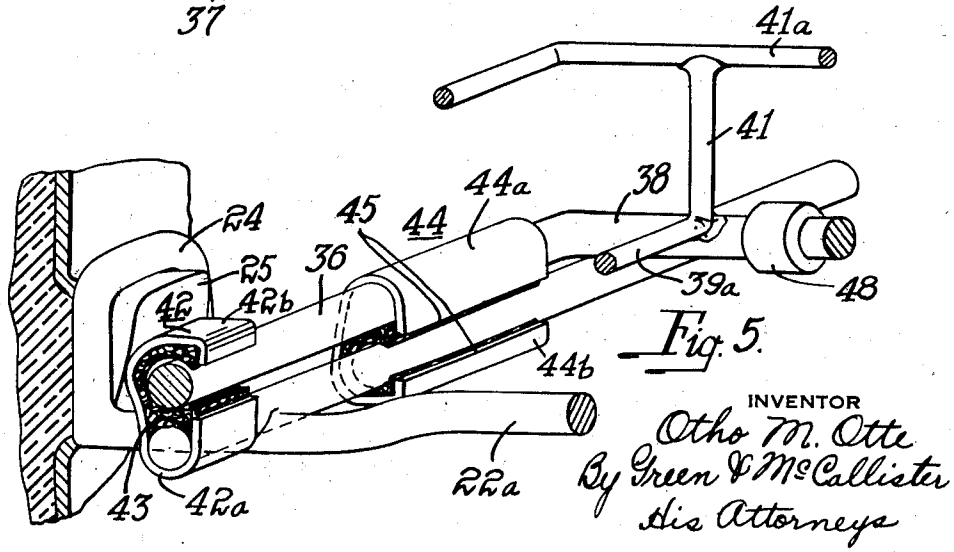


Fig. 5.

INVENTOR
Otho M. Otte
By Green & McCallister
His Attorneys

April 3, 1934. O. M. OTTE 1,953,688

SLIDING SHELF FOR REFRIGERATORS

Filed July 24, 1931 3 Sheets-Sheet 3

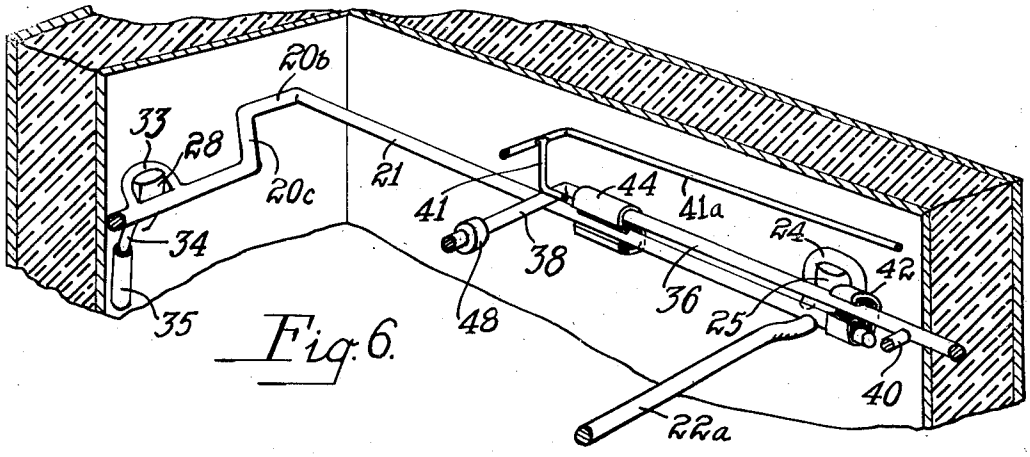


Fig. 6.

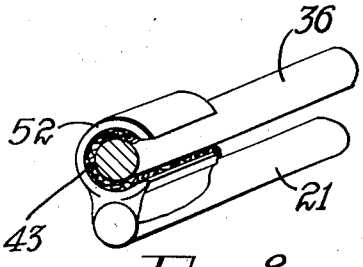


Fig. 8.

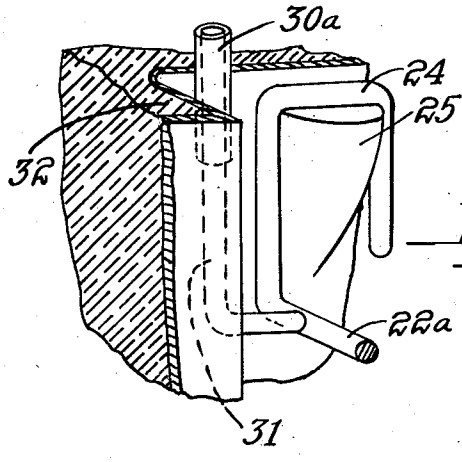


Fig. 7.

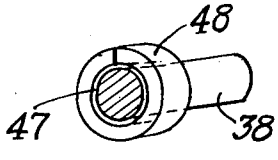


Fig. 9.

INVENTOR
Otho M. Otte
By Green & McCallister
His Attorneys

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UNITED STATES PATENT OFFICE

1,953,688

SLIDING SHELF FOR REFRIGERATORS

Otho M. Otte, Tarentum, Pa.

Application July 24, 1931, Serial No. 552,866

13 Claims. (Cl. 211—143)

This invention relates to refrigerators and more particularly to sliding shelves for refrigerators, that is, shelves which may be moved in and out of the refrigerator compartment within which they are normally positioned for the purpose of easily placing materials thereon and removing the same from said shelves.

With the advent of the present day household refrigerators and particularly those equipped with refrigerating units, as distinguished from the older form of ice containers, it has become customary to make the interior walls of metal and either to coat the same with vitreous enamel or enamel paint or to make the same from a rustless and stainless metal. The supports for the shelves are now usually struck up from the metal of the walls; the struck up portions assuming the shape of nubbins or bumps of sufficient size and of such contour as to form adequate supports for the stationary shelves or sliding shelf support frame.

The stationary shelves, as well as the sliding shelves and their support frames are usually made of iron wire rod and are generally dipped in a galvanizing bath or otherwise coated with some protective metal such as cadmium or tin.

Competition has become so keen among the manufacturers of this type of household refrigerator that it has become necessary to cut the cost of accessories such as shelves, to the lowest possible point consistent with usability.

In designing the so-called sliding shelves for use in these refrigerators, a number of things must be taken into consideration in order to make such shelves satisfactory.

They must be relatively cheap to manufacture; they must be easy to assemble and install; they must be capable of being supported and removably held in place without materially departing from the type of shelf holding or supporting means now employed; they must be capable of being moved (slid) in and out of the refrigerator compartment without chattering and without noise and with little effort on the part of the user. They must be capable of being plated or coated in the usual and customary way; in use, the coating or plating material must not become removed by abrasion from the intersliding parts, and they must be substantial and rigid, both when in normal position and when in extended position.

An object of this invention is to produce a sliding shelf structure for refrigerators having all of the above attributes and which from a commercial point of view is highly satisfactory.

In most places where sliding shelves or the like are used, that is, in filing cabinets, in ovens, in cabinets for boots and shoes, in toasters and broilers, in wardrobes and the like, it is not imperative that the shelf or the like, a drawer for instance, be slidable without vibration or chatter, but in refrigerators it is imperative that there be no chatter or vibration. It is often desirable to carry on a sliding refrigerator shelf dishes or glasses filled with liquid and if the sliding shelf vibrates or chatters as it is slid to and from position within the refrigerator compartment, such liquid may be spilled. I have noticed this particularly in those refrigerators which I have seen and which have sliding shelves with metal to metal contact between the support points of such shelves and their support frames. I have operated such sliding shelves and have witnessed others operating the same and I have failed to find any in which the shelves did not chatter or vibrate during the sliding movements thereof and to such an extent as to render such shelves impractical.

I have found this defect to be present whether the shelves were loaded or unloaded and whether the load was light or heavy. I believe this defect inherent in all sliding shelf structures in which the contact points are metal to metal.

I believe the above defect could be partially, if not wholly eliminated if the shelf structures including the shelves and the supporting frames were built as precision instruments from non-rusting metal and if the refrigerator compartments were also built as precision devices wherein the refrigerator walls and the supporting elements embodied in their make-up were absolutely accurate as to position and dimensions. In commercial refrigerators, however, precision manufacture is impossible and a further object of this invention has been to produce a practical sliding shelf structure for commercial refrigerators in which the shelf vibration or chatter is so reduced in amount that the shelves may be slid back and forth or to and from position within the refrigerator compartment without spilling liquids contained in vessels placed upon such shelves.

These, as well as other objects, I attain by means of the structures described in the specification and illustrated in the drawings accompanying the same and forming a part of this application.

In the drawings:—

Figure 1 is a top plan view of a sliding shelf and its supporting frame shown in connection with a more or less diagrammatic refrigerator compartment.

Figure 2 is a view similar to Fig. 1 and illustrates certain modifications in the supporting frame and in the refrigerator compartment.

Figure 3 is a side sectional elevation taken on line III—III of Fig. 1, looking in the direction of the arrows.

Figure 4 is a view in perspective of a portion of the structure shown in Fig. 1 and especially those portions of the structure adjacent the forward end of the left side of Fig. 1.

Figure 5 is a view similar to Fig. 4 but applies to the forward left-hand side of Fig. 2.

Figure 6 is a perspective view of the right-hand corner of Fig. 2 and takes in a portion of the back of the refrigerator compartment and a portion of the right-hand side wall shown in Fig. 2 with portions of the shelf supporting frame and the shelf shown in place thereon.

Figure 7 illustrates a modification of the means for preventing the rear of the support frame from tipping up when the shelf is fully extended and with a load thereon.

Figure 8 is a detail view of a modified form of rod and shelf embracing element.

Figure 9 illustrates a form of cushion bumper and its mounting such as utilized to cushion the innermost movements of the shelf on its support frame.

Both forms of the device as shown in Figures 1 and 2 are similar in the main but differ somewhat in details of construction.

Each form embodies a supporting frame, preferably made from wire rod and formed so as to provide guide members which parallel the refrigerator compartment side walls. In each form, these support frames rest upon the support elements which are embodied in the make-up of the refrigerator compartment side and rear walls and in each form, means are provided for preventing the support frame and therefore the shelf, from tipping, when the shelf is extended and is carrying a load.

The shelf is the same in both forms and consists of a rectangular frame to which longitudinally extending spaced wire rods are secured (preferably by welding) and which form the shelf bottom. A cross bar located midway between the front and back of the frame and secured to the frame side bars, is utilized for stiffening the shelf floor.

If cost did not have to be considered in these sliding shelf structures, it would be preferable to make the same of wire rod composed of a non-rusting and stainless ferrous alloy, a number of which alloys are now on the market and which contain in addition to the iron about 18% of chromium and about 8% of nickel.

A highly satisfactory structure may be produced by making the support frames from two kinds of metal; the side bars from a stainless alloy such as above referred to and the front and back members from ordinary iron wire rod and the side members of the shelf of the same stainless alloy with the rest of the shelf made from ordinary iron wire rod.

It is preferable to have the side rods of the shelf support frame and the side rods of the shelf proper made from polished wire rod of the stainless variety and in order to provide a commercially satisfactory sliding shelf assembly, I preferably hot galvanize both the support frame and the shelf proper. The effect of this is that the front and back rods of the support frame become galvanized while the side rods take on but a skin of coating metal and this is also true of the side rods of the shelf proper while the rest of the shelf structure is in this way galvanized.

When this method of making the shelf support frame and the shelf proper is utilized, the welds are preferably made at the corners of the structures, the stainless rods being readily welded to the ordinary iron rods.

The cheapest structure, however, and that which will probably be most satisfactory from the cost standpoint alone, is that in which the entire shelf support frame and shelves are made from ordinary iron wire rod and hot galvanized or coated with cadmium or some other rust preventing coating material such as Duco or bakelite.

I have found that no matter what metal is used for the side rods of both the shelf and support frame, the most satisfactory operation, the smoothest sliding movement of the shelf on the support frame, substantially noiseless movement with no chatter or vibration, can be obtained by making the points of contact between the shelf and the support frame of some fibrous material such as felt or soft open pored wood or more or less firmly compacted pith or like material made from paper stock or some such fibrous substance. Such contact points reduce to a less than negligible amount the chatter occasioned by irregularities of surface or misalignment of the support rod and the shelf side rods and because there is no metal to metal contact between these parts of the structure, a quite smooth sliding shelf is obtained.

In the form of device illustrated in Figure 1, the shelf support frame is made up of a back bar 20, side bars 21 and a front bar 22. The back bar parallels the back wall of the refrigerator compartment 23 while the side rods parallel the side walls of the compartment and are located but a slight distance therefrom. The front bar is extended forwardly slightly beyond the side bars and each end of the front bar is provided with an upstanding hook member 24. These hooks are adapted to hook over support elements 25 which are struck up from the metal forming the side walls 26 of the compartment and which project a distance inwardly from the plane of the wall.

The back wall 27 is preferably provided with two support elements 28 similar to support elements 25 and formed in the same manner. The back bar or rod 20 adjacent each support element 28 is provided with a depending arm 29 and each of these arms is preferably provided with a snugly fitting yielding rubber sleeve 30 which lies in close contact with the back wall 27 of the refrigerator compartment.

Arms 29 in combination with the downwardly depending or extending hooks 24 and support elements 25 and 28, securely anchor or hold the shelf support frame in position within the compartment in such a manner that the back of the support frame is prevented from tilting or tipping up even when the shelf carried thereby is fully extended and carries any load such as it would normally carry. As seen, these hooks 24 and arms 29 are adapted to lie parallel to the associated walls of the compartment.

If desired, arms 29 may be omitted and arms 31 (Fig. 7) substituted therefor, if the refrigerator compartment is provided with front wall projections as shown in Figs. 2 and 7. Arm 31 which is secured to the front bar 22*a* extends forwardly from said bar and upwardly at a right angle thereto. The yielding rubber sleeve 30*a* carried on the upper end of arm 31 bears snugly against

this front wall extension and prevents the rear of the shelf support arm from tipping up when the loaded shelf is extended.

The support frame may be formed from iron wire rod or the back and front rods may be formed of iron wire rod and the side rods 21 may be formed of rustless iron or steel or of metal such as Allegheny metal. The rods may be weld joined at the corners of the frame and the frame may be hot galvanized. When this is done, the front and back rods will be galvanized and the side rods will remain ungalvanized, except for a light skin coating, since these rustless or stainless alloys as well as Allegheny metal do not take a heavy adherent coat by ordinary galvanizing methods.

In Fig. 1, I have shown a refrigerator compartment in combination with which it is possible to use a sliding shelf of substantially the same width as the compartment. This, as will be seen, is accomplished by making the front door opening the full width of the compartment.

In Fig. 2, the standard type of compartment is shown in which the side walls are inturned to provide front wall projections 32. These decrease the effective space for sliding shelves and also make the refrigerator compartment more difficult to clean, as will be readily understood.

The form of support frame utilized in the shelf structure of Fig. 2 is illustrated more or less in detail in Figs. 5 and 6.

In this form, there are side rods 21 which are straight from front to back and which parallel the compartment side walls as in the form of Figure 1. The major portion 20*a* of the back rod parallels the compartment back wall and is depressed below the side rod and each end of the back rod is provided with a short portion 20*b* which lies in the plane of the side rod 21 and parallels the compartment back wall. An angular portion 20*c* joins the major portion 20*a* and short portion 20*b*.

Adjacent each end of portion 20*a*, there is an offset loop 33 which bends backwardly and hooks over one of the support elements 28 embodied in the make-up of the compartment back wall. Adjacent each of these loops is a depending arm 34 which is also offset as shown in Fig. 6 by being bent backwardly so that the rubber sleeve 35 which surrounds its lower end bears against the compartment back wall and serves to prevent the support frame from tipping upward at its rear when the shelf is fully extended and under load.

Of course, if desired, an upwardly extending anchoring member similar to anchor 31 of Fig. 7 may be provided at the front end of the support frame in the form of Fig. 2, if so desired and this may be in substitution for the anchor arms 34 at the rear or may be supplemental thereto, that is, anchor arms may be used at both the front and the rear of the support frame in either of the forms shown in Figure 1 or Figure 2.

In both forms the shelf proper is rectangular and preferably occupies substantially all of the available space in the refrigerator compartment, that is, the shelves are as large as it is possible to make the same and still be capable of sliding in and out through the door opening.

The shelves are constructed with side bars 36, a front bar 37 and a rear or back bar 38. The floor of the shelf is constructed of evenly spaced bars 39 which rest on the front and back bars and are preferably spot welded thereto. A central stiffening bar 40 aligned with the front bar is positioned midway of the shelf and to this the bars 39 may or may not be spot welded.

Certain of the bars 39*a* are longer than the remainder and are bent upwardly at right angles to the remaining bars 39 to provide posts 41 for a retaining rail 41*a* which surrounds the shelf and is spaced a distance above the floor of the shelf.

The front bar of the support frame in the form shown in Fig. 2 is bent upwardly throughout the central portion (see Figure 6) as shown at 22*a* to provide increased clearance below the support frame and in both forms (Figs. 1 and 2); the side bars 21 extend a slight distance in front of the front bar 22 and rest upon the front bar to which they are preferably spot welded. Because of this construction, the front bar and the entire back bar of the support frame in the form shown in Fig. 1 and the ends of the back bar of Fig. 2 are slightly offset, that is, the back bars are raised the width of the bars above the front bars. Each side bar 21 at its forward end and in front of the front bar 22 to which it is preferably spot welded as described above, carries a housing 42 preferably made from sheet metal and formed into such shape as to provide a portion 42*a* which surrounds the side rod and to which it is preferably spot welded and a portion 42*b* which surrounds the adjacent side rod of the shelf but in spaced relation and within this portion 42*b* is positioned a fibrous liner 43 which partially surrounds the adjacent side rod of the shelf and yieldingly tends to hold the same in position above the adjacent support frame side bar 21.

Secured to each shelf side bar 36 adjacent its rear end is a housing 44 having a portion 44*a* which partially surrounds the side bar 36 of the shelf and to which it is preferably spot welded and a portion 44*b* which partially surrounds the adjacent side rod 21 of the support frame and a fibrous liner 45 is positioned within this portion 44*b* and tends to hold the shelf and the support frame in alignment.

These fibrous liners serve as contact points between the shelf and the support frame and since there are two contact points on each side of the structure one located ahead of the other and since these four contact points hold the shelf in alignment with the support frame and in addition serve as bearing surfaces during the sliding movements of the shelf, and since they are formed of yielding material, a material which offers little if any friction, undesirable movements of the tray are reduced to a minimum. Any chatter of the shelf during sliding movements due to irregularities of the surface of the side bars of the shelf or support frame, or irregularities due to misalignment, kinks or bends in the same is prevented.

It has been found that these liners formed of non-gripping material make all the difference between a successful sliding shelf and an unsuccessful one and I have found that it is possible to slide a shelf of the type shown, back and forth or in and out of the refrigerator compartment over 8000 times without removing sufficient coating from either the side rods to cause said rods to rust (those of the support frame and those of the shelves) and this where such side rods are formed of ordinary iron wire rod hot galvanized.

The rear part of the shelves at each side thereof is preferably provided with a bumper element which when the shelf is moved to its innermost position acts as a resilient stop and prevents jar

and noise. Such a stop is illustrated in Fig. 9 and preferably consists of a split metallic spring ring 47 to which is secured either a rubber or felt covering 48. The split ring and covering permits these bumpers to be sprung into position.

Where a superlative structure is to be made, the entire shelf is formed of an alloy of the stainless variety for instance such an alloy as is known as 18–8 or Allegheny metal which, as before said, is a ferrous alloy containing about 18% chromium and about 8% nickel with the remainder principally iron. If cost is of paramount importance, the shelf can be made of ordinary iron wire rod and coated as by galvanizing, or, the side rods only may be formed from an alloy of the stainless variety and the entire shelf galvanized or otherwise coated.

In Fig. 8, I have shown a slight modification in the form of the housing elements such as 42 and 44 and in this form, portion 52 which contains the fibrous liner is formed circular or nearly so in order to more nearly conform to the shape of the side rod which slides within its fibrous yielding liner.

In both forms of the device (Figs. 1 and 2) in order to disconnect the shelf from its support frame, it is merely necessary to remove the assembled structure from the refrigerator compartment and slide the shelf back until the back bar of the shelf is a slight distance in back of the back bar of the support frame at which time the retaining elements will become disconnected from the rods which they embrace.

The forward movement of the shelf is limited by the embracing elements on the forward ends of the side bars of the support frame.

When the shelf is moved forwardly and past the position at which the shelf tends to tip (this depends on the disposition of the load on the shelf), the fibrous liners within the embracing elements carried on the forward ends of the side rods of the support frame act as yielding fulcrums about which the shelf pivots. The bottom portions of the fibrous liners within the embracing elements secured to the shelf proper, contact with the side bars of the support frame and form yielding guide members for the shelf.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:—

1. In a compartment having support elements incorporated in its wall make up, the combination of a sliding shelf structure, said structure including a shelf and a shelf support frame, the support frame being constructed to rest on the support elements and to provide guide rods which parallel the compartment side walls; means for preventing the back of the shelf support frame from tipping up when the shelf is fully extended; means for locking together the shelf and its support frame while allowing free sliding movement of the shelf; the said means for locking together the shelf and its support frame comprising at least four retaining elements one being located adjacent the forward end of each of the support frame side rods and one located adjacent the rear end of each shelf side rod; fibrous liners for each retaining element whereby said shelf is adapted to be slid back and forth relative to its support frame without chatter and without noise.

2. A combination according to claim 1, in which the shelf support frame has a wire rod construction of the form of a hollow rectangle without cross braces.

3. A combination according to claim 1, in which the side rods of the support frame extend forwardly beyond a front rod of the frame and in front of said forward retaining elements.

4. A combination according to claim 1, in which the means for preventing the back of the shelf support frame from tipping comprises at least one member that extends at an angle to the plane of the support frame and contacts with a wall of the compartment wall standing at a right angle to side walls of the compartment and at a point removed from the plane of the support frame.

5. A combination according to claim 1, in which the support frame is provided with hook-like members that hook over the support elements on the walls of the compartment.

6. In a compartment having support elements incorporated in its wall make up, the combination of a sliding shelf structure, said structure including a shelf and a shelf support frame, said support frame having a front bar provided with an upstanding hook member at each end thereof positioned parallel to side walls of the compartment and cooperating with support elements thereof, and means for slidably supporting said shelf upon said shelf support frame, said support frame having a rear bar provided with at least one depending loop portion for cooperating with a support element on a back wall of the compartment, said loop portion terminating in a depending arm portion extending parallel to said wall so that the back portion of said shelf support frame will be prevented from tipping up when said shelf is fully extended.

7. In a compartment having support elements incorporated in its wall makeup, the combination of a sliding shelf structure, said structure including a shelf and a shelf support frame, said support frame having a front bar provided with an upstanding hook member at each end thereof positioned parallel to side walls of the compartment and cooperating with support elements thereof, means movably supporting said shelf on said support frame, said support frame having a rear bar provided with a plurality of downwardly depending arms, said arms being mounted parallel to a back wall of the compartment and cooperating with support elements thereof.

8. In a compartment having support elements incorporated in its wall makeup, the combination of a sliding shelf structure, said structure including a shelf and a shelf support frame, said shelf support frame and said shelf each having side bars cooperatively associated with side bars of the other, each side bar of said shelf support frame having a housing rigidly secured thereto, said support frame housing being provided with a portion cooperating with an adjacent side bar of said shelf, each side bar of said shelf also having a housing mounted thereon, said shelf housing being spaced from said support frame housing, said shelf housing having a portion cooperating with an adjacent side bar of said shelf support frame, so that said shelf will be slidably and securely mounted on said shelf support frame.

9. In a compartment having support elements incorporated in its wall makeup, the combination of a sliding shelf structure, said structure including a shelf and a shelf support frame, said shelf and said support frame each having side bars cooperatively associated with side bars of the other, each side bar of said support frame having a housing rigidly secured thereto and extending therefrom, said support frame housing having a portion cooperating with an adjacent side bar of

said shelf, a fibrous liner positioned between each housing and an associated side bar of said shelf, so that said shelf will be slidably and quietly movable with respect to said support frame.

10. In a compartment having support elements incorporated in its wall makeup, the combination of a sliding shelf structure, said structure including a shelf and shelf supporting frame, said shelf and said supporting frame each having side bars cooperatively associated with side bars of the other, forwardly positioned housings welded to the side bars of said support frame, said support frame housings each having a portion at least partially surrounding adjacent side bars of said shelf, a fibrous liner mounted in said housings between the walls thereof and associated side bars of said shelf, housings welded on the side bars of said shelf rearwardly of said support frame housings, said shelf housings having a portion cooperating with and at least partially surrounding adjacent side bars of said support frame, a liner mounted within each housing between the walls thereof and associated side bars of said support frame, said housings being provided for slidably and noiselessly supporting said shelf on said support frame.

11. In a sliding shelf structure, the combination of a shelf member and shelf support frame member, said members each having side bars cooperatively associated with side bars of the other, and a plurality of housing means mounted over the cooperatively associated side bars of said members for slidably supporting said members with respect to each other, and a fibrous lining disposed within each of said housings for preventing clattering and excessive wear of said members with respect to each other.

12. In a sliding shelf structure, the combination of a shelf member and a shelf support member, said members each having side bars cooperatively associated with side bars of the other, and housing means welded on side bars of one of the cooperatively associated side bars and partially extending around the other of the cooperatively associated side bars, and a yieldable fibrous lining disposed within said housing and between said side bars, so that said members may be slidable with respect to each other and that chattering and excessive wear between the side bars may be prevented.

13. In a sliding shelf structure, the combination of a shelf member and a shelf support frame member, said members each having side bars cooperatively associated with side bars of the other, a housing rigidly secured to opposite side bars of said shelf member near one end thereof and extending around the cooperatively associated side bars of said frame member, a housing rigidly secured to opposite side bars of said support frame member near the other end thereof and extending around the cooperatively associated side bars of said shelf member, so that said members may be slidable with respect to each other, and fibrous lining positioned within each of said housings therebetween the cooperatively associated side bars of said members for preventing clattering and excessive wear therebetween.

OTHO M. OTTE.