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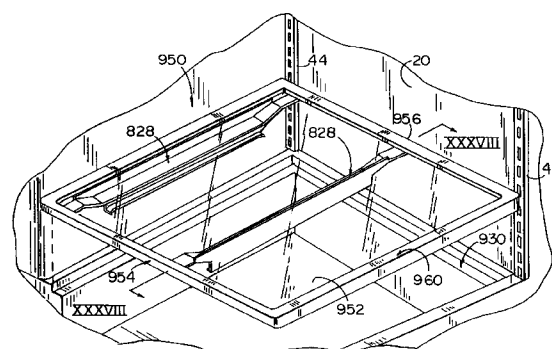
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(54) **Moulded refrigerator shelf with snap-in slide.**

(57) A refrigerator shelf assembly (950) with snap-in slides (828) for supporting a sliding bin, receptacle or other separate member is disclosed having a shelf panel (952) and a front rim (954) extending across at least a portion of a front edge of the shelf panel. The front rim extends below the shelf panel and has at least one front slide receptacle (856). A back rim (956) extends across at least a portion of a back edge of the shelf panel and below the shelf panel and has at least one back slide receptacle (852). A pair of slides (828) for receiving and supporting a bin under the shelf panel are removably mounted in the front and back slide receptacles (846,852).



**FIG. 37**

This invention relates to shelving for refrigerators and similar appliances. More particularly, the present invention further relates to slide brackets for storage bins, drawers, pans, or other sliding members which are commonly used with refrigerator shelving.

Refrigerator shelving has evolved from fixed wire racks or even adjustable racks supported by simple brackets or pegs projecting from the interior walls of a refrigerator compartment, to the complex shelving units now widely available and commonly used in refrigerators. This evolution has been spurred by competitive refrigerator vendors seeking to make their products more adaptable and convenient to the needs and uses of each consumer. The result is numerous task or function specific shelf assemblies of varying width and comprising a variety of slidable drawers, storage bins, pans, etc. which are typically mounted under the shelf panel.

These complex shelving units commonly incorporate a plethora of equally complicated moulded or extruded plastic and metal components which must be assembled to form the sophisticated shelving units. Typically, the width of the sliding member supported under the shelf panel of these complex shelving units is dictated by the width of the shelf assembly. Furthermore, the support structure for the sliding member is typically riveted to supporting side brackets for the entire shelf assembly or otherwise fixed relative to the shelf panel. Thus, having a variety of shelf assembly widths mandates that a variety of sliding members must also be provided. This duplication rapidly increases costs for the manufacturer and vendor in terms of increased inventory and further in other production costs. Rather than running a production of standard width sliding members, the manufacturer must accommodate sliding members having a variety of widths, according to the width of the shelf assembly with which that sliding member will be used.

The commonly known refrigerator shelf assembly is also typically task-specific. A shelf assembly directed to supporting articles thereon is not readily convertible to the added task of providing under shelf sliding storage with a bin or drawer for example. Conversely, a shelf assembly directed to providing a sliding member under the shelf panel is also not commonly adaptable to the singular task of providing only a shelf. While the sliding member may often times be removed and set aside, the slides themselves which support the sliding member under the shelf panel are typically an integral part of the shelf assembly and may not be easily removed, but must remain, typically projecting downward from the shelf assembly and interfering with items stored on adjacent shelving, below the subject shelf panel.

The present invention addresses this evolution of expense and complexity and seeks to provide a uniquely simple refrigerator shelf assembly having

versatility to easily overcome or at least mitigate these problems.

Thus, according to a first aspect of the present invention, there is provided a shelf assembly suitable for a refrigerator, the assembly comprising:

a shelf panel having a front edge and a back edge;

a front rim extending along (or across) at least a portion of the front edge and having a portion below the shelf panel that is provided with a front slide attachment means;

a back rim extending across at least a portion of the back edge and having a portion below the shelf that is provided with a back slide attachments means; and

the shelf assembly being adapted for receiving and supporting a sliding member in sliding engagement under the shelf panel, the slide being removably secured to both the front and back attachment means.

Thus, suitably the front rim and/or back rim will extend below the shelf panel. They may define, respectively, at least one front slide receptacle and at least one back slide receptacle. It will be appreciated that preferred embodiments for each attachment means is suitably a receptacle, such as a recess. The slide can preferably be removably coupled with the front slide receptacle and the back slide receptacle, in preferred embodiments.

The shelf assembly is preferably provided with at least one slide.

The slide will suitably be adapted for receiving, supporting and allowing sliding motion of one or more sliding members. Sliding members include storage bins, drawers, pans or other suitable container capable of containing or supporting one or more items that are intended to be kept in the refrigerator.

Suitably the or each slide (one may be sufficient but in some situations a plurality will be preferred, suitably a pair) can be removably secured in a number of different positions which may allow the accommodation of different sliding members which may be of different widths. The or each slide may be positioned at a particular distance apart to allow a certain sliding member to be accommodated. The flexibility of movement of the slides allows sliding members of varying width to be used with the shelf assembly invention.

The slide can be attached to the shelf assembly by any suitable attachment means or fastening means as appropriate, but preferably involves the front and/or back rim, such as portions of such rims extending below the shelf panel. Thus each front and rear (or back) attachment means may take the form of, in conjunction with the slide, male and female co-operating members. It is preferred, although it is not essential that the slide is provided with one or more male members while suitable co-operating female members are provided on the shelf assembly, usually in the front

and/or back rim, as appropriate. The male members may take the form of bosses, protrusions or other suitable projections, while the female member may be in the form of a groove, channel, recess, receptacle or aperture suitable for receiving the male member.

Preferably the or each slide has:

an elongate body portion with an opposing front and back (or rear) ends;

a front attachment member (e.g. a male member) adapted for releasable engagement with the front slide attachment means (or front slide receptacle) projecting from a front end; and

a back attachment member (e.g. a female member) adapted for releasable engagement with the back slide attachment means (e.g. the back slide receptacle) projecting from the back end.

The front attachment means suitably comprises a recess in the front rim, such as having an open side facing towards the back edge. The back attachments means suitably comprises a recess, such as in the back rim, preferably having an open side facing towards the front edge. Each front and back attachment members preferably have a generally rectangular shape in cross-section and each front and back slide attachment means may have a corresponding rectangular shape in cross-section.

Suitably the attachment member and slide receptacle shapes in cross-section are wider than they are thick, that is to say with the width positioned generally parallel with the shelf panel.

The back slide attachment means preferably has a retainer for retaining the back attachment member in it.

Suitably the shelf panel is tempered glass and each of the front rim and back rim comprises a resinous plastics material. For aesthetic reasons it is sometimes preferred that at least one of the front and back rims is flush with a top surface of the shelf panel. In some embodiments the shelf assembly further comprises at least a pair of shelf brackets for supporting the shelf panel. These brackets may be adapted for attachment inside the refrigerator.

Suitably at least one of the front and back rims projects above the top surface of the shelf panel. The shelf assembly may be provided with a perimeter rim which incorporates the front and back rims. The perimeter rim may thus circumscribe the shelf assembly and may also project above (a top surface of) the panel to define a spill dam, in order that any liquid disposed or spilled upon (the top surface of) the panel may be contained by the perimeter rim.

Preferably the shelf panel, the front rim, the back rim (or the perimeter rim where present) and the or each shelf brackets (when present) are one piece. The back slide receptacle preferably includes a retainer for resisting uncoupling of the slide from the back slide receptacle.

Thus, in preferred embodiments, a shelf assembly

for a refrigerator comprising:

a one piece shelf member having a shelf panel, a front rim and a back rim;

the shelf member having a front edge and a back edge;

the front rim extending across at least a portion of the front edge, extending below the shelf panel, and defining at least one front slide receptacle;

the back rim extending across at least a portion of the back edge, extending below the shelf panel, and defining at least one back slide receptacle; and

at least one slide for receiving and supporting a separate member in sliding engagement under the shelf panel, the slide being removably coupled with the front slide receptacle and the back slide receptacles.

In preferred embodiments, where a perimeter rim is provided, this may incorporate not only each of the front and back rims, but also at least a pair of shelf brackets (for supporting the shelf member).

The invention thus also extends to a shelf assembly for a refrigerator having a shelf panel, a front rim extending below the shelf panel, a back rim extending below the shelf panel, the assembly having one or more slides, the or each slide comprising:

and elongate member adapted for releasable coupling with each of the front rim and back rim;

means defining a co-operating front slide receptacle in the front rim for releasably coupling with the elongate member; and

means defining a co-operating back slide receptacle in the back rim for releasably coupling with the elongate member.

Suitably the rim comprises a mouldable material and may be made using a mould.

A second aspect of the invention relates to a refrigerator provided with one or more shelf assemblies in accordance with the first aspect. In this specification refrigerator encompasses chambers or containers in which food, drink or other edible substances are to be cooled or to be kept cool, and includes freezers. Other features and characteristics of the second aspect are as for the first aspect *mutatis mutandis*.

Accordingly, the present invention provides a simplified snap-in slide unit for enhanced versatility of a refrigerator shelf assembly. The shelf assembly includes a shelf panel with a front rim portion extending across at least a portion of a front edge of the panel and extending below the panel wherein a front slide receptacle is defined and with a back rim portion extending across at least a portion of a back edge of the panel and extending below the panel wherein a back slide receptacle is defined. The slide can be removably coupled with the front and back slide receptacles, suitably for receiving and supporting a bin or other sliding member under the shelf panel.

In one embodiment of the invention, the slide has

an elongate body portion with a front attachment member projecting from a front end of the elongate body and with a back attachment member projecting from an opposing back end of the elongate body. In another embodiment the front and back slide receptacles are defined by a recess in each of the front and back rims of the shelf assembly, respectively. The front slide receptacle may have an open side toward the back edge of the shelf panel and the back slide receptacle can have an open side toward the front edge of the panel. Preferably the shelf assembly is moulded in one piece.

Thus, the present invention may provide a simplified shelf assembly with a snap-in slide. Versatility of the shelf assembly can be enhanced by the ease with which the slide may be provided to the shelf support a sliding member under the shelf and the ease of removing the slide. One or more slides may be present: a pair of slides for supporting a slide member may be uniformly spaced for use of standard width slide members, regardless of the shelf assembly width. If a plurality of slide receptacles are provided, then the position of the slide member relative to the shelf assembly may also be easily adjusted.

The use of a slide can also reduce manufacturing costs. The slide may be conveniently moulded in a one-step process. The slide may also be well-suited to use with a shelf having a moulded rim and is especially suited for use with a one-piece, moulded shelf assembly. Such a slide arrangement may further suppress costs by reducing inventory requirements of shelf assemblies to meet a variety of needs.

These other objects, advantages and features of the present invention will become apparent upon review of the following embodiments in conjunction with the drawings.

The invention will thus be described in further detail by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a fragmentary perspective view of the interior of a refrigerator provided with a first embodiment of a shelf according to the present invention;

Fig. 2 is a fragmentary perspective view of the interior of a refrigerator provided with a second embodiment of a (sliding) shelf according to the present invention;

Fig. 3 is a fragmentary section along line III-III of a front edge of the shelf of Fig. 1;

Fig. 4 is a fragmentary section along line IV-IV of a front edge of the shelf of Fig. 2;

Fig. 5 is a fragmentary section along line V-V of a side edge of the shelf of Fig. 1;

Fig. 6 is a fragmentary section along line VI-VI of a side edge of the shelf of Fig. 2;

Fig. 7 is a fragmentary section along line VII-VII of a rear edge of the shelf of Fig. 1;

Fig. 8 is a fragmentary section along line VIII-VIII

of a rear edge of the shelf of Fig. 2;

Fig. 9 is a fragmentary side elevation of a rear end of a support bracket;

Fig. 10 is a perspective view of the shelf of Fig. 2 partially extended and having a first embodiment of a shelf stop;

Fig. 11 is a fragmentary section along line XI-XI of the shelf stop shown in Fig. 10;

Fig. 12 is a fragmentary rear elevation of the shelf stop of Fig. 11;

Fig. 13 is a fragmentary section along line XIII-XIII of the shelf stop of Fig. 11;

Fig. 14 is a fragmentary side elevation of the shelf of Fig. 2 having a second, alternative, embodiment of a shelf stop;

Fig. 15 is a fragmentary section along line XV-XV of the shelf of Fig. 14;

Fig. 16 is a fragmentary side elevation of the shelf of Fig. 2 with a third embodiment of a shelf stop;

Fig. 17 is a fragmentary section along line XVII-XVII of Fig. 16;

Fig. 18 is a fragmentary side elevation of the shelf of Fig. 2 having a fourth embodiment of a shelf stop;

Fig. 19 is a fragmentary section along line XIX-XIX of Fig. 18;

Fig. 20 is a fragmentary section along line XX-XX of Fig. 19;

Fig. 21 is a fragmentary side elevation of the shelf of Fig. 2 having a fifth embodiment of a shelf stop;

Fig. 22 is a fragmentary section along line XXII-XXII of Fig. 21;

Fig. 23 is a fragmentary section along line XXIII-XXIII of Fig. 22;

Fig. 24 is a fragmentary side elevation of the shelf of Fig. 2 having a sixth embodiment of a shelf stop;

Fig. 25 is a fragmentary section along line XXV-XXV of Fig. 24;

Fig. 26 is a fragmentary section along line XXVI-XXVI of Fig. 25;

Fig. 27 is a perspective view of a third embodiment of a shelf assembly according to the present invention, shown in place in a refrigerator;

Fig. 28 is a fragmentary plan of the shelf assembly of Fig. 27;

Fig. 29 is a side elevation of the shelf of Fig. 27;

Fig. 30 is a fragmentary section along line XXX-XXX of Fig. 27;

Fig. 31 is an enlarged view of detail XXXI of Fig. 28;

Fig. 32 is a fragmentary section along line XXXII-XXXII of Fig. 31;

Fig. 33 is a fragmentary section along line XXXIII-XXXIII of Fig. 27;

Fig. 34 is a section of the slide of the shelf assembly taken along line XXXIV-XXXIV of Fig. 30;

Fig. 35 is a perspective view of a fourth embodi-

ment of a shelf assembly according to the present invention;

Fig. 36 is a section along line XXXVI-XXXVI of Fig. 35;

Fig. 37 is a perspective view of a fifth embodiment of a shelf assembly according to the present invention;

Fig. 38 is a section along line XXXVIII-XXXVIII of Fig. 37.

Referring now to the drawings in greater detail and Fig. 1 in particular, a refrigerator shelf assembly 10 according to the present invention comprises a generally planar shelf member 12, metal support brackets 14 and 16 and a moulded, resinous perimeter rim 18. Shelf assembly 10 is preferably cantilevered forward by brackets 14 and 16 from the rear wall 20 of a refrigerator.

Shelf member 12 may be a light transmitting material, preferably optically clear tempered glass, to enhance light distribution through the refrigerated compartment. Shelf member 12 has a perimeter edge 22 (Figs. 3 and 5) which is supported above brackets 14 and 16 and positioned to overlap above inwardly projecting flange portions 26 of the brackets. Flange portions 26 project inwardly toward each other at the top edge of generally vertical web portions 30 of each bracket 14 and 16 are mirror images of each other.

While shelf assembly 10 may be used as a fixed shelf, it is preferably used as a vertically adjustable shelf. Therefore, as shown in Fig. 9, the rear ends 40 and 42 of brackets 14 and 16 are preferably adapted for releasable engagement with shelf tracks 44 provided on rear wall 20 of the refrigerator as is commonly practiced. Recesses 412 and 43 functions as hooks which engage over rungs 45 in tracks 44 to suspend the brackets. Thus, shelf assembly 10 may be positioned at a plurality of locations spaced vertically along tracks 44. Shelf assembly 10 is preferably sized to provide air circulation space between side portions 60 and 62 and the side walls 22 of the refrigerator as well as between rear edge 58 and rear wall 20 of the refrigerator to provide for proper circulation around the shelf. Furthermore, the length of shelf assembly 10 is determined to provide air circulation space between the front edge 54 and the door (not shown) of the refrigerator.

Rim 18 is moulded around the entire perimeter edge 22 of shelf member 12 as well as the flanges 26 of brackets 14 and 16 for tight engagement and connection of shelf member 12 with brackets 14 and 16 (Fig. 5). Each of the flanges 26 is provided with a series of perforations 24 to assure secure mechanical connection between rim 18 and each support bracket 14, 16. During assembly, shelf member 12 and support brackets 14 and 16 are held positioned within a mould while a mouldable material from which rim 18 is made is injected and flows into the mould around the peripheral edge 22 of shelf member 12 and flange

portions 26 and through perforations 24, encapsulating the edge 22 and flange portions 26. The mouldable material of which rim 18 is comprised may include copolymer plastics materials such as a combination of ethylene and polypropylene or other structural, resinous plastics such as ABS or polyvinyl chloride. Furthermore, a colouration pigment can be added to the mouldable plastic used for moulding rim 18 prior to moulding to provide desired colours to the rim. For example, titanium dioxide may be added for a white colouration.

As the mouldable material cures, i.e., cools, hardens and sets, it becomes a tough and resilient mass extending continuously around the perimeter edge 22 of shelf member 12 for holding shelf member 12 in position above the flange portions 26 of support brackets 14 and 16. The inward extension of flanges 26 can provide secure, stable support for shelf 12. Rim 18 is moulded to extend above the top surface 46 of shelf member 12 and is specifically moulded to define a continuous vertical wall 48 near the perimeter edge 22 of shelf member 12 forming a spill dam for containing spills occurring upon the shelf member 12 (Figs. 3, 5 and 7).

While the seal formed between rim 18 and shelf member 12 by moulding rim 18 around shelf member 12 performs quite satisfactorily, depending on the specific resinous plastics material chosen, one may wish to enhance the seal by coating perimeter edge 22 and the adjoining top 46 and bottom 50 surfaces of shelf member 12, adjacent perimeter edge 22, prior to the moulding of rim 18 therearound with a primer layer or coating of a heat activatable, resinous material which promotes and facilitates the adhesion of the rim material to the glass shelf member 12.

As shown in Fig. 3, a decorative trim piece 52 may be moulded into rim 18 along the front edge of shelf member 12. Likewise, a decorative trim piece 56 may be moulded into rim 18 along the rear edge 58 of shelf member 12 (Fig. 7).

Alternatively, a slidable shelf assembly 110, a second embodiment according to the present invention, is shown in Fig. 2 and comprises a slidable shelf member 112, metal support brackets 114 and 116, and a moulded, resinous perimeter rim 118. Shelf assembly 110 is also preferably cantilevered forward by brackets 114 and 116 from the rear wall 20 of a refrigerator.

Shelf member 112 comprises a generally planar shelf panel 113 and rim 118. Shelf panel 113 may be a light transmitting material, preferably optically clear tempered glass, to enhance light distribution through the refrigerated compartment. Shelf panel 113 has a perimeter edge 122 which is encapsulated by perimeter rim 118 (Fig. 6).

Rim 118 is moulded around the perimeter edge 122 of shelf panel 113. During assembly, shelf panel 113 is held in position within a mould while a mould-

able material is injected and flows into the mould around perimeter edge 122. Again, the mouldable material may be a copolymer or other structural plastics material. Also, a colouration pigment, as previously discussed, may be added to the material used for moulding rim 118. Rim 118 is also moulded to extend above the top surface 146 of shelf panel 113 and is specifically moulded to define a continuous vertical wall 148 near the perimeter edge 122 of shelf panel 113 forming a spill dam for containing spills occurring upon the shelf member 112 (Figs. 4, 6 and 8).

The seal between rim 118 and shelf panel 113 may be enhanced by coating perimeter edge 122 and the top 146 and bottom 150 surfaces of shelf panel 113 near perimeter edge 122 with a primer layer of a heat activatable, resinous material as previously described.

A shelf pull 180 is moulded along the front edge 154 of shelf member 112 by extending the lower edge 178 of rim 118 downwardly (Fig. 4). Furthermore, as shown in Fig. 4, a decorative trim piece 152 may be moulded into rim 118 along the front edge 154 of shelf member 112. A decorative trim piece 156 may also be moulded into rim 118 along the rear edge 158 of shelf member 112 (Fig. 8).

As is best seen in Figs. 2 and 6, a generally V-shaped channel is moulded into the outwardly facing side surface of each side portion 160 and 162 of rim 118 to define slide guides 166. A corresponding, generally V-shaped ridge 167 is formed along the top edges 126 of each support bracket 114 and 116 defining slide rails 170 for sliding engagement with the slide guides.

The support brackets 114 and 116 of shelf assembly 110 are mirror images of each other, having rear ends 140 and 142 identical to bracket ends 40 and 42 of brackets 14 and 16, and are adapted for releasable engagement with shelf tracks 44. Tracks 44 are provided on rear wall 20 of the refrigerator as is commonly practiced for vertically adjustable shelf positioning of the shelf assembly 110 along tracks 44. A pair of cross braces 132 and 134 connecting between webs 128 and 130 of support brackets 114 and 116 are provided for holding the support brackets in spaced relation to each other. Brace 132 is connected to each web 128 and 130 near the forward ends 136 and 138 of brackets 114 and 116. Brace 134 is connected to each web 128 and 130 at a position approximately one-third to one-half of the length of brackets 114 and 166 forward of ends 140 and 142. Cross braces 132 and 134 are required in sliding shelf assembly 110 to stabilise the support brackets 114 and 166 and to maintain the proper positioning of front ends 136 and 138 of the brackets, precluding the front ends from spreading apart as a load is applied to the shelf assembly 110. Shelf assembly 110 also includes one of six different embodiments 210, 310, 410, 510, 610 or 710 of a shelf stop to preclude the inadvertent over-

extension of the slidable shelf.

A first embodiment of a shelf stop is shown in Figs. 10 to 13 and comprises a lever 210 mounted on a pivot rod 212 and a pair of pivot rod mounts 214 and 216 projecting downward from the rear edge 158 of shelf member 112, near bottom surface 150. Lever 210 has a top end 218 which projects above the perimeter rim 118 for manipulation by a user. Lever 210 also has a lower end 220 defining a catch 222 for engagement with cross braces 132 and 134. As the shelf member 112 is slid forward, the catch 222 approaches and engages the brace 134 precluding further extension of the shelf. The relative position of brace 134 controls the extension of shelf member 112 and is preferably approximately one-third to one-half the length of brackets 114 and 166 forward of ends 140 and 142. The shelf stop may be released by sliding the shelf rearward sufficiently to move catch 222 away from brace 134 and moving the lever 210 to a release position as shown by broken lines in Fig. 13. Lever 210 is easily pivoted to the release position by pressing rearward on face 219 of lever 210 near its top end 218. With the lever in the release position, the catch 222 can slide above and past the brace 134. If the lever 210 is released to pass brace 134 and allowed to return to its latch position, the catch 222 will engage the other brace 132 as the shelf member 112 is extended. By keeping the lever 210 in the release position, shelf member 112 can be fully removed. A return spring 217 may be mounted with lever 210 to bias the lever to the latch position. Alternatively, lever 210 may be designed so that the force of gravity is sufficient to bias the lever to the latch position.

A second embodiment of a shelf stop is shown in Figs. 14 and 15 and comprises a slot 310 cut into at least one slide rail 168 and 170 and a cooperating stop pin 312 mounted in a fixed position and projecting from perimeter rim 118 at the corresponding slide guide 164 and 166 into the slot 310. The slot 310 has a front end wall 314 and a rear end wall (not shown) to limit the movement of pin 312 for limiting the extension and retraction of shelf assembly 110. The length and position of the slot 310 in combination with the position of the stop pin 312 will dictate the length of extension for shelf member 112, which is preferably in the range of one-third to one-half the length of the shelf support brackets 114 and 116. Use of this shelf stop embodiment generally precludes the removal of the shelf member 112 from the support brackets 114 and 116, but does not inhibit the removal of the entire shelf assembly 110 from the refrigerator compartment. Brackets 114 and 166 must be assembled to shelf member 112 with stop pins 312 received in slots 310 before mounting the entire assembly on tracks 44.

A third embodiment of a shelf stop is shown in Figs. 16 and 17 and comprises a formed metal clip 410 mounted to the bottom surface 172 of the peri-

meter rim 118 along at least one side portion 174 and 176 of the rim 118. The clip 410 is configured with an inclined front abutting surface 412 for engagement with a cross brace 132 or 134 to limit the extension of the shelf member 112. The relative position of clip 410 will determine the extension of shelf member 112. Clip 410 is preferably bent from a strap of steel or formed from other resilient material so that the clip 410 will deform when forced past the cross brace and will resume its original configuration once past the cross brace. Clip 410 is preferably removably mounted to the perimeter rim 118 by a screw 414 so that it can be removed rather than requiring that it be forced past the cross brace during assembly and disassembly of the shelf assembly 110. Alternatively, the shelf assembly can be removed from tracks 44 and disassembled.

A fourth embodiment of a shelf stop is shown in Figs. 18 to 20 and comprises a detent 510 pressed out of the side 178 of at least one of the slide rails 168 and 170 and a corresponding groove or channel 512 cut or moulded into the side of the corresponding slide guide 164 and 166. The relative position of detent 510 and the relative position and length of channel 512 will control the extension of shelf member 112. Again, the brackets with slide rails 168 and 170 are assembled to shelf 112 such that detent 510 is received in channel 512 prior to mounting the entire assembly in tracks 44.

A fifth embodiment of a shelf stop is shown in Figs. 21 to 23 and comprises a detent 610 projecting from the end of a flexible finger 612 formed in at least one of the slide rails 168 and 170 and a notch 614 cut or moulded into the side of the corresponding slide guide 164 and 166. Again, the relative positioning of the detent and notch will determine the extension of shelf member 112. Also, shelf member 112 can be removed from the support brackets 114 and 116 by forcing the notch 614 past the resilient detent 610.

A sixth embodiment of a shelf stop is shown in Figs. 24 to 26 and comprises a groove 710 formed in at least one of slide rails 168 and 170 and a cooperating protrusion 712 formed on the corresponding slide guide 164 and 166. An inclined camming surface 714 with an end wall 716 projecting into the groove 710 is formed over a portion of the length of the groove 710. The protrusion 712 is moulded with a cooperating inclined camming surface 718 and upstanding end wall 720 so that the shelf member 112 can be assembled by sliding the shelf member 112 into the front ends 140 and 142 of support brackets 114 and 116 and forcing protrusion 712 past the stop wall 716 in the groove. The perimeter rim 118 material of which the protrusion 712 is formed is sufficiently flexible and resilient so that protrusion 712 will deform as its camming surface 718 engages and slides over the camming surface 714 of the rail groove 710 and will resume its undeformed configuration once end wall

720 is past the stop end wall 716. Removal of shelf member 112 must be accomplished by removal of the entire assembly from tracks 44 followed by removing brackets 114 and 166 from the slide rails 168 and 170.

Referring to figures 27 to 34, a third embodiment of a shelf assembly 820 according to the present invention includes a shelf panel 822 having a front rim portion 824, a back rim portion 826, and preferably a pair of slides 828 (Fig. 27).

In Fig. 27 the shelf assembly 820 further includes a pair of support brackets 830 which may cantilever forward from a rear wall 20 of a refrigerator. Brackets 830 are preferably elongate members which extend along at least a portion of opposing sides 834 and 836 of shelf assembly 820. Most preferably, brackets 830 releasably engage shelf tracks 44 provided on rear wall 20, for vertical adjustment of shelf assembly 820. Brackets 830 therefore have hooks 840 formed at a back end of brackets 830 for engaging rungs in tracks 44 (Figs. 29 and 30).

Shelf panel 822 is supported by brackets 830 and may be contoured to facilitate a variety of specific purposes, but generally provides a planar surface to support items placed thereon for storage in a refrigerator. Most preferably, shelf panel 822 is circumscribed by a perimeter rim 842 which incorporates a front portion 824 and a back portion 826 (Figs. 27, 31 and 32). Brackets 830 may be separate plastics or metal components or moulded in one piece with perimeter rim 842.

Shelf panel 822 may be formed from a light-transmitting material, preferably optically clear, tempered glass, to enhance light distribution through the refrigerator compartment, as previously discussed in greater detail. In the embodiment shown in Fig. 27, however, shelf panel 822, brackets 830, and perimeter rim 842 are most preferably one piece, moulded in a convenient one-step process. During this process, a mouldable material is injected and flows into a continuous cavity mould, defining entire shelf assembly 820. The mouldable material may be any of a variety of suitable plastics materials, including copolymers such as combination of ethylene and polypropylene or other structural, resinous plastics materials, for example such as ABS or polyvinyl chloride. Furthermore, a colouration pigment to provide desired colours may be added to the mouldable plastic material. A whitening colouration such as titanium dioxide may be used for example.

As the mouldable material cures, that is cools, hardens, or sets, it becomes a rough and resilient mass, forming shelf panel 822, perimeter rim 842, and support brackets 830 in one piece. Perimeter rim 842 may be moulded to project above the surface of shelf panel 822 and form a spill dam as shown in the embodiment of Figures 27 to 29, or may be made flush with the top surface of the shelf panel, similar to the embodiment shown in Figure 35. In either embodi-

ment, perimeter rim 842 includes at least a lower portion 844 which extends below shelf panel 822 (Figs. 30 to 32).

A front slide receptacle 846 is preferably defined in lower portion 844 of front rim portion 824 during the moulding process and may be provided at any desired location along front rim portion 824 and at a desired number of location, including, but not limited to, adjacent each side 834 and 836 of shelf assembly 820 for example (Figs. 28 and 32). Each front slide receptacle 846 comprises a recess defined in a rear surface 848 of the lower portion 844 of front rim portion 824 extending generally parallel to shelf 822. Each front slide receptacle 846 is a generally rectangular recess having a width which is greater than its height. Each front slide receptacle 846 has an angled side wall 850 (Figs. 28 and 33). This wall 850 is angled to accommodate the addition and removal of slide 828 which is discussed further below.

Similarly, a back slide receptacle 852, corresponding to each front slide receptacle 846, may likewise be defined in lower portion 844 of back rim portion 826 (Figs. 29-31). Alternatively, each back slide receptacle 852 is preferably defined between a forward projecting portion 854 of back rim portion 826 which extends below shelf panel 822, and a cooperating tab 856 which projects forward from back rim portion 826 and is spaced below portion 854. Each back slide receptacle 852 is a generally rectangular slot extending generally parallel to the shelf 822 and having a width greater than its height. Furthermore, each back slide receptacle 852 has an open side 858 located away from the adjoining shelf assembly side 834, 836. Back slide receptacle 852 also includes a retainer 860 formed by a protrusion or half-cylinder projection at open side 858 (Fig. 33).

A plurality of cooperating front and back slide receptacles 846, 852 may also be provided along each of front rim portion and back rim portion 824, 826, respectively, so that slides 828 may be positioned along the length of front and back rim portions 824 and 826. Thus, a slide member (not shown) supported by slides 828 may selectively be positioned along the width of the shelf assembly 820, and slide members of various widths may be accommodated.

Slide 828 is an elongate member with opposing front and back ends 864 and 866, respectively (Fig. 30). A tab 868 extends from front end 864 and forms a front attachment member having a generally rectangular cross-sectional shape corresponding to front slide receptacle 846. Likewise, a back tab 870 extends from back end 866, forming a back attachment member having a generally rectangular cross-sectional shape corresponding to back slide receptacle 852.

A body portion of slide 828 is defined by a generally vertically oriented plate portion 872 and a pair of vertically spaced rails 874 and 876 projecting gen-

erally perpendicularly to vertical plate 872 and in the same general direction from one side of vertical plate 872 (Fig. 34). Vertical plate 872 and the rails 874, 876 define an open-sided, open-ended slide track 878 for receiving and supporting a cooperating slide member 880 of a storage bin, drawer, pan, or other separate member for use in the refrigerator. Rail 876 includes downwardly curved ends so that the supported slide member, bin, or drawer can more easily be slid into place. The upper rail 874 merges with front and back tabs 868 and 870 at each of the ends 864, 866 of slide 828, respectively. Thus, slide 828 is symmetrical end to end and eliminates the need for left- and right-hand counter parts.

In use, a slide 828 is easily installed by positioning the front and back tabs 868, 870 of slide 828 parallel to, adjacent, and under shelf panel 822, inserting front tab 868 into a front slide receptacle 846, and swinging back tab 870 through open side 858, past retainer 860, and into a corresponding back slide receptacle 852. As back tab 870 is swung past retainer 860, slide 828 snaps into place generally parallel with bracket 830. Slide 828 is simply removed by reversing the installation steps. Since slide 828 is preferably symmetrical end to end so that left-hand and right-hand side slides are not necessary, an identical unit may be installed in either a left-hand or right-hand position.

A fourth embodiment of a shelf assembly 920, according to the present invention is shown in Fig. 35 and includes a shelf panel 922, a front rim portion 924, a back rim portion 926 and a pair of slides 828. Shelf assembly 920 is preferably used as a bottom refrigerator shelf and may be positioned in a cooperating recess 930 provided at the bottom of a refrigerator as shown in Fig. 35, or may be supported by other methods commonly known in the refrigerator shelf field.

Shelf assembly 920 is most preferably moulded in one piece from a mouldable material as discussed above. In shelf assembly 920, a perimeter rim 942, including front portion 924 and back portion 926, may be moulded to project above a top surface of shelf panel 922 to form a spill dam. Alternatively and preferably, the rim is moulded flush with the top surface of shelf panel 922 as shown in Figure 35. The perimeter rim 942 includes at least a lower portion 944 which extends below shelf panel 922. As shown in Figures 30 to 33 and discussed previously regarding shelf assembly 820, shelf assembly 920 also has front slide receptacles 946 and back slide receptacles 952 defined in front rim portion 924 and back rim portion 926, respectively, for releasably coupling with slide 828.

A fifth embodiment of a shelf assembly 950 is shown in Figure 37. Shelf assembly 950 includes a shelf panel 952, a front rim 954, and a back rim 956. Shelf assembly 950 may be used as a bottom refrigerator shelf and supported by a variety of methods in



a bottom shelf position, including a cooperating recess 930 provided at the bottom of a refrigerator as shown in Fig. 37 for example.

Shelf panel 952 is preferably optically clear tempered glass or other light-transmitting material to enhance light distribution through the refrigerator compartment.

Shelf panel 952 has a perimeter edge 958 which is preferably encapsulated by a perimeter rim 960 (Fig. 38). Rim 960 incorporates front rim 954 and back rim 956 and is moulded around perimeter edge 958 of shelf panel 952. Shelf panel 952 is held in position within a mould during assembly while a mouldable material is injected and flows into the mould around perimeter edge 958 as discussed previously in greater detail. Rim 960 is moulded to extend above shelf panel 952, specifically to form a spill dam for containing spills which may occur upon shelf member 950 (Figs. 37 and 38).

Rim 960 includes a lower portion 962 which extends below shelf panel 952. Shelf assembly 950 also includes front slide receptacles 846 and back slide receptacles 852 defined in front rim 954 and back rim 956, respectively, for releasably coupling with slide 828 as previously discussed in greater detail regarding shelf assembly 820.

## Claims

### 1. A refrigerator shelf assembly comprising:

a shelf panel having a front edge and a back edge;

a front rim extending along at least a portion of the front edge and having a portion below the shelf panel provided with a front slide attachment means;

a back rim extending across at least a portion of the back edge and having a portion below the shelf panel provided with a back slide attachment means; and

at least one slide for receiving and supporting a sliding member in sliding engagement under the shelf front and back panel, the slide being removably secured to both the front and back attachment means.

### 2. A shelf assembly according to claim 1 wherein the slide has:

an elongate body portion with opposing front and back ends;

a front attachment member adapted for releasable engagement with the front slide attachment means projecting from a front end; and

a back attachment member adapted for releasable engagement with the back slide attachment means projecting from the back end.

3. A shelf assembly according to claim 2 wherein the front attachment means comprises a recess in the front rim, suitably having an open side facing towards the back edge, and the back attachment means comprises a recess in the back rim, suitably having an open side facing towards the front edge.

4. A shelf assembly according to claim 2 or 3 wherein each front and back attachment members has a generally rectangular cross-sectional shape and each front and back slide attachment means has a corresponding rectangular cross-sectional shape.

5. A shelf assembly according to any of claims 2 to 4 wherein the back slide attachment means includes a retainer for retaining the back attachment member in the back slide attachment means.

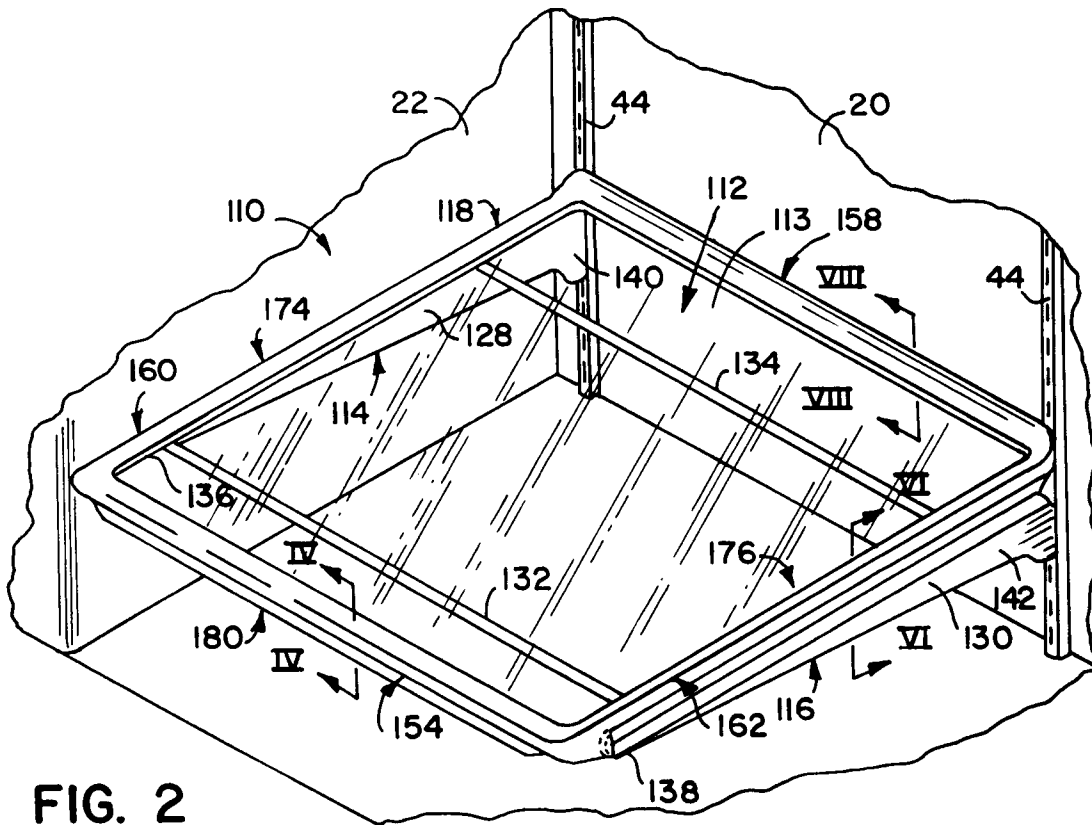
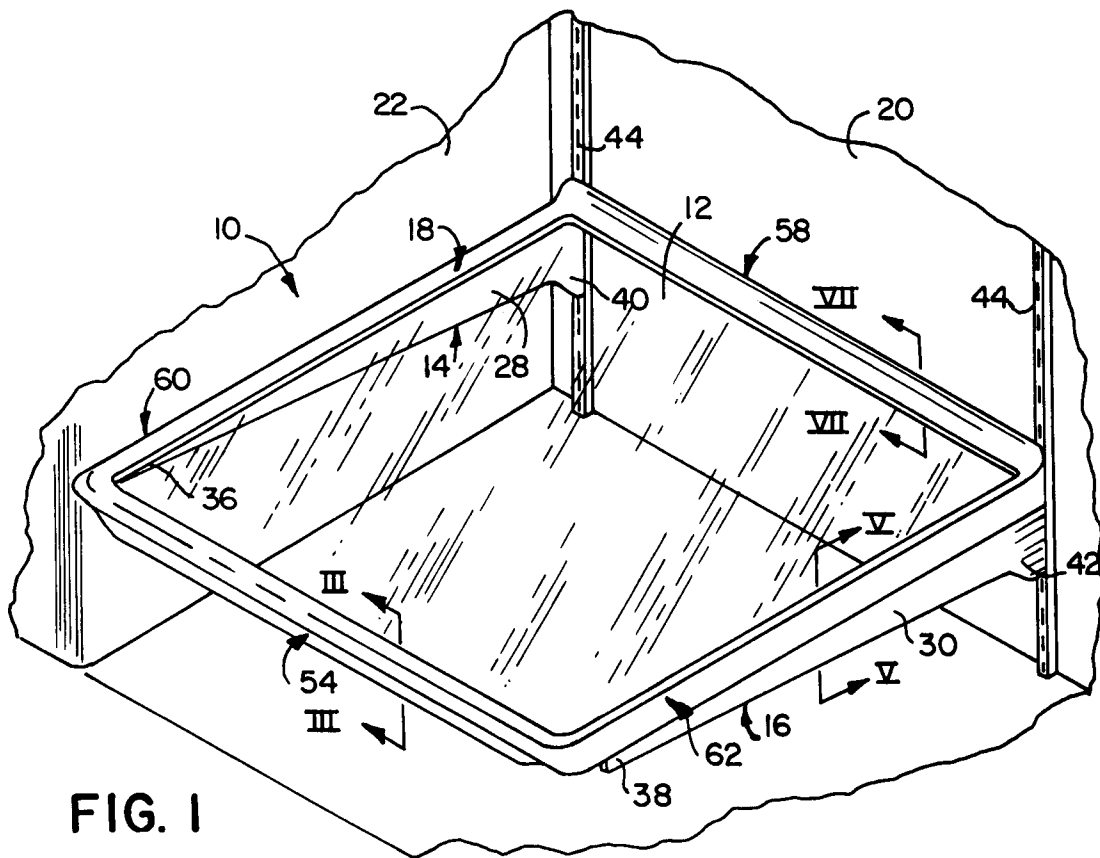
6. A shelf assembly according to any preceding claim having a perimeter rim which incorporates the front and back rims and circumscribes the shelf assembly and projects above the panel to define a spill dam so that a liquid disposed upon the panel is contained by the perimeter rim.

7. A shelf assembly according to any preceding claim wherein the rim is made of a mouldable material in a mould.

8. A shelf assembly according to any preceding claim wherein at least one of the front and back rims is flush with a top surface of the panel.

9. A shelf assembly according to any preceding claim wherein the or each slide can be removably secured in a number of different positions to accommodate sliding members of different, corresponding widths.

10. A refrigerator provided with a shelf assembly according to any preceding claim.



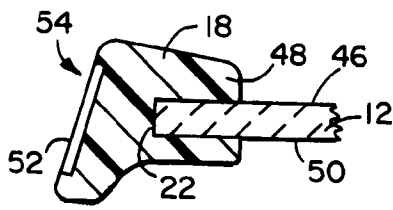


FIG. 3

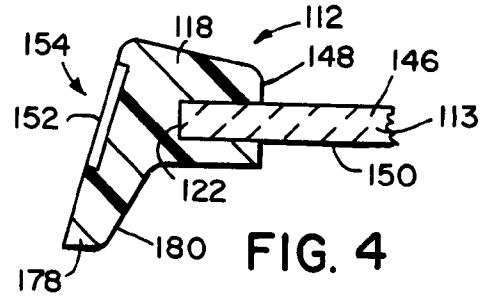


FIG. 4

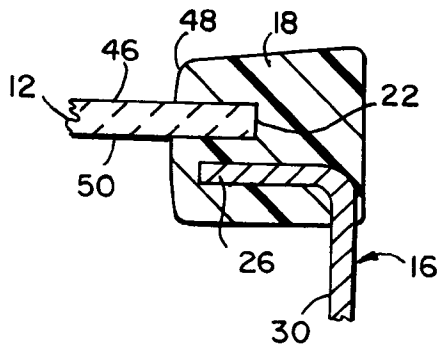


FIG. 5

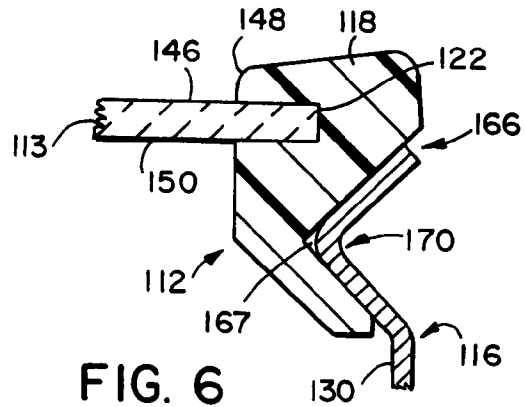


FIG. 6

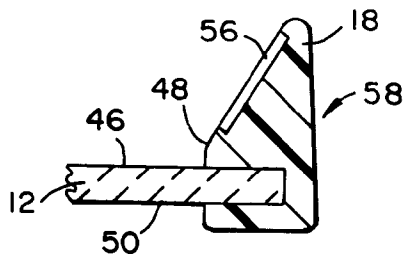


FIG. 7

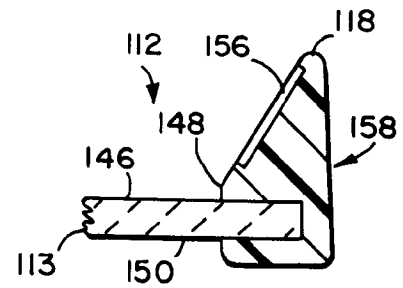


FIG. 8

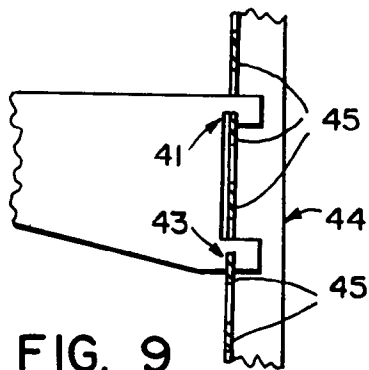


FIG. 9

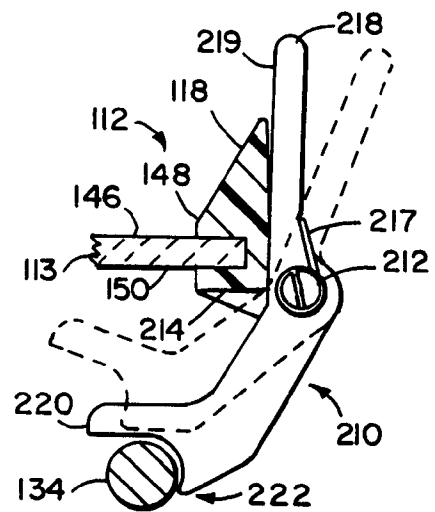


FIG. 13

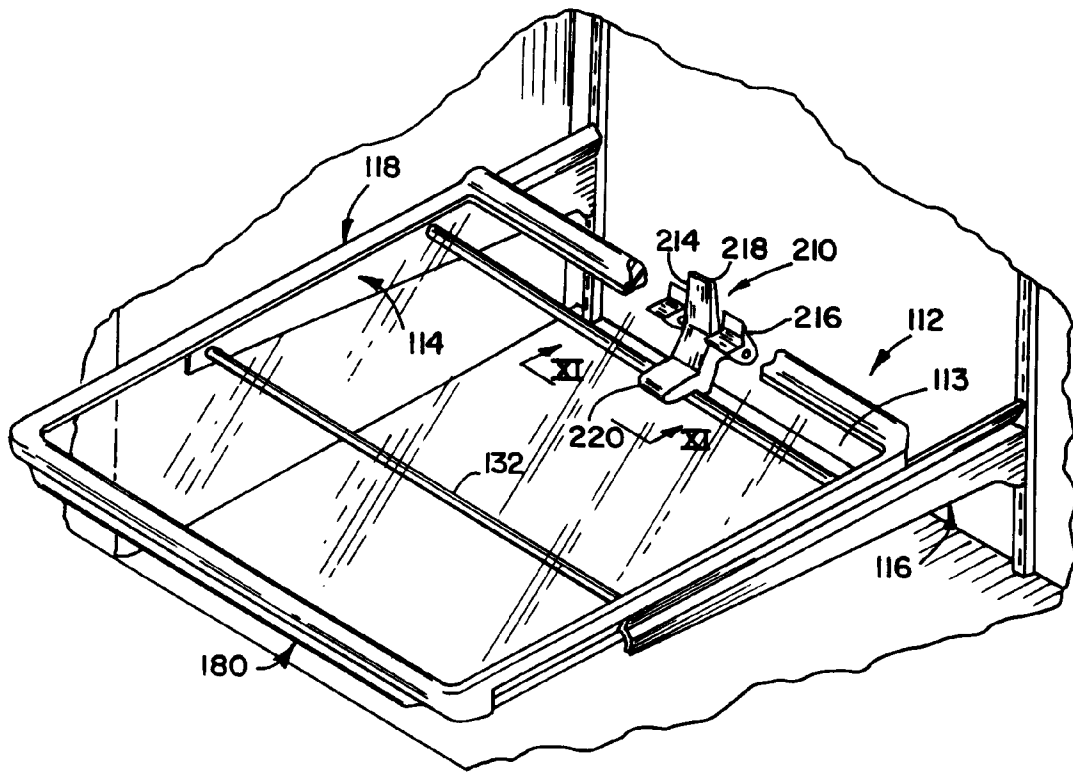


FIG. 10

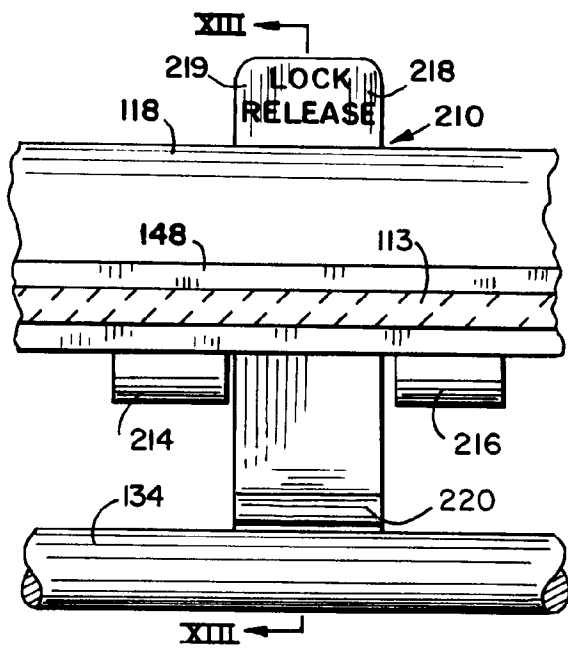


FIG. 11

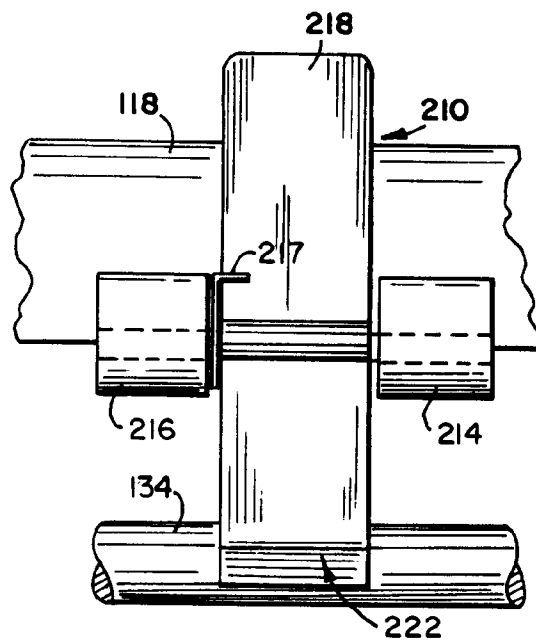


FIG. 12

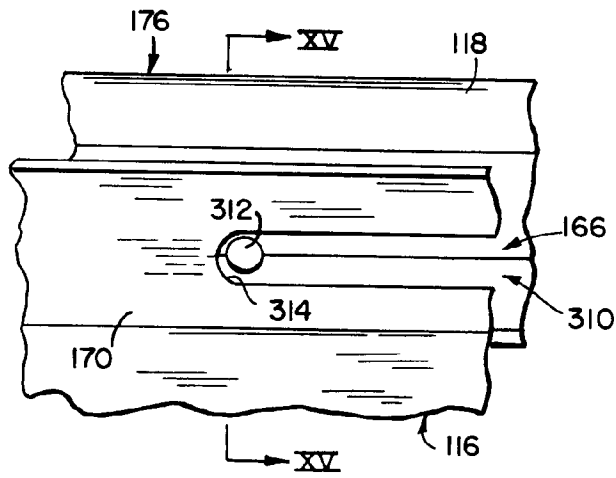


FIG. 14

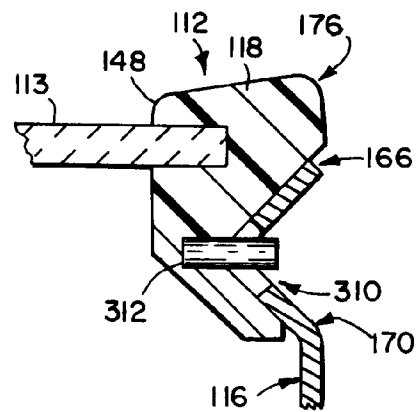


FIG. 15

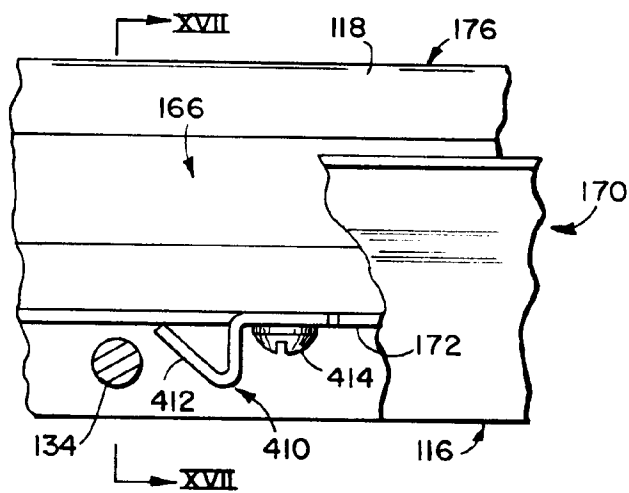


FIG. 16

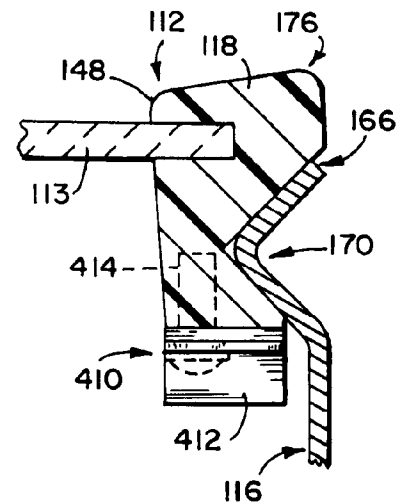


FIG. 17

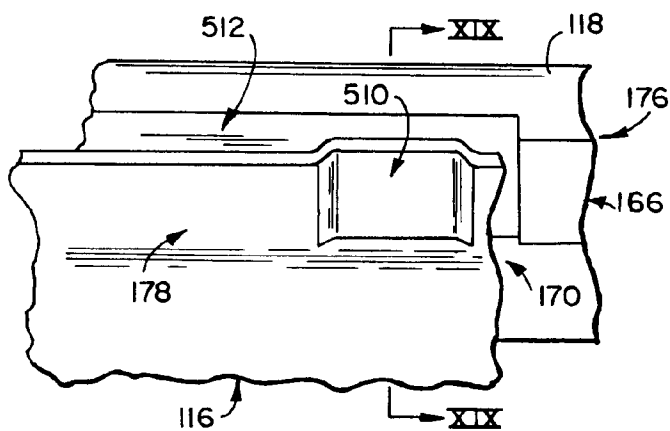


FIG. 18

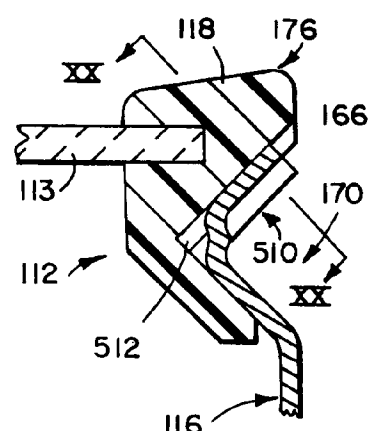


FIG. 19

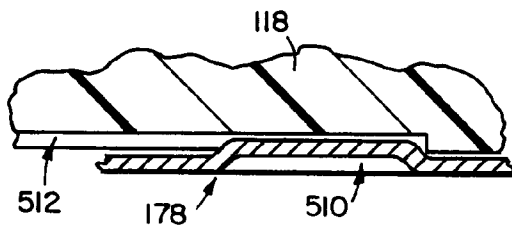


FIG. 20

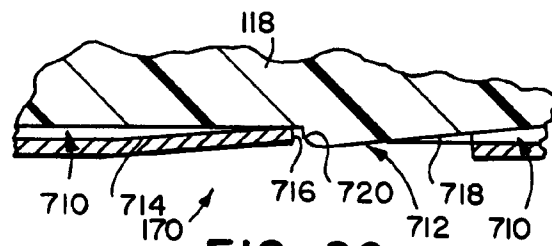


FIG. 26

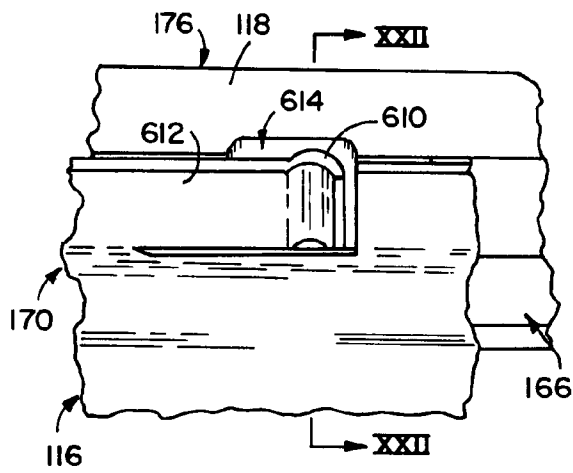


FIG. 21

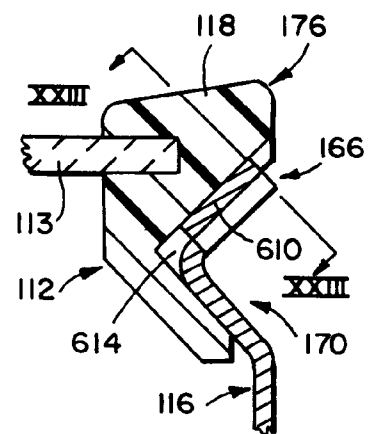


FIG. 22

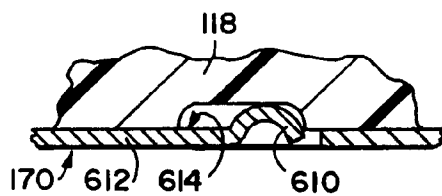


FIG. 23

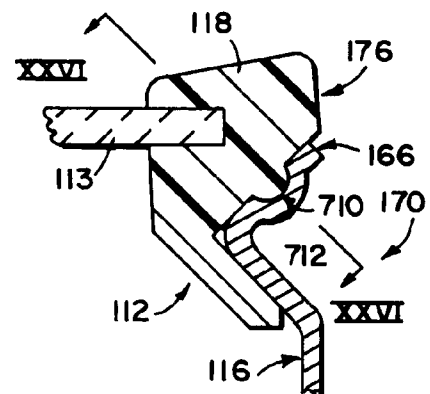


FIG. 25

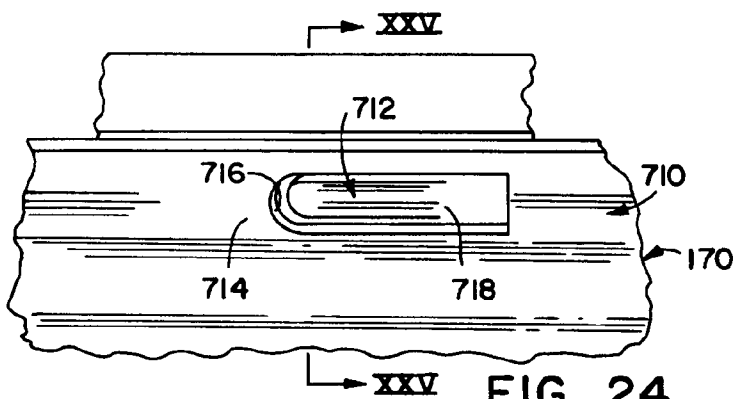
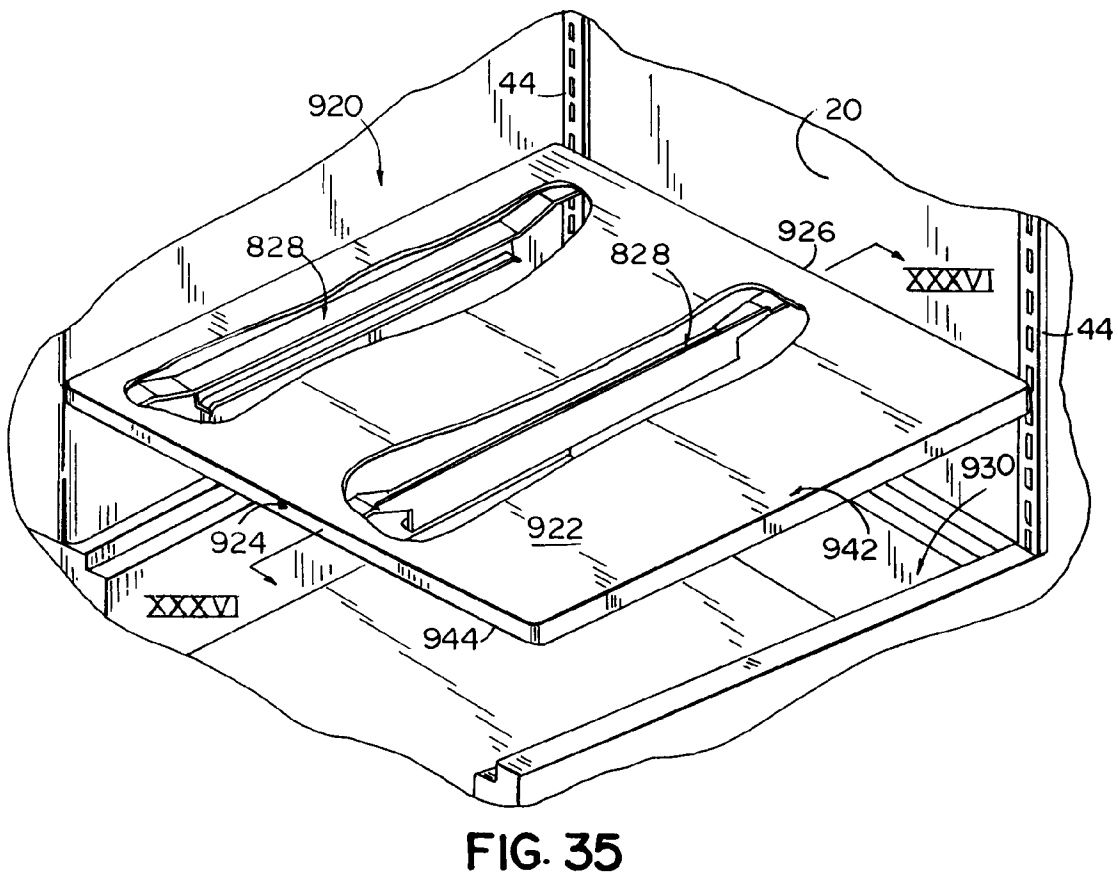
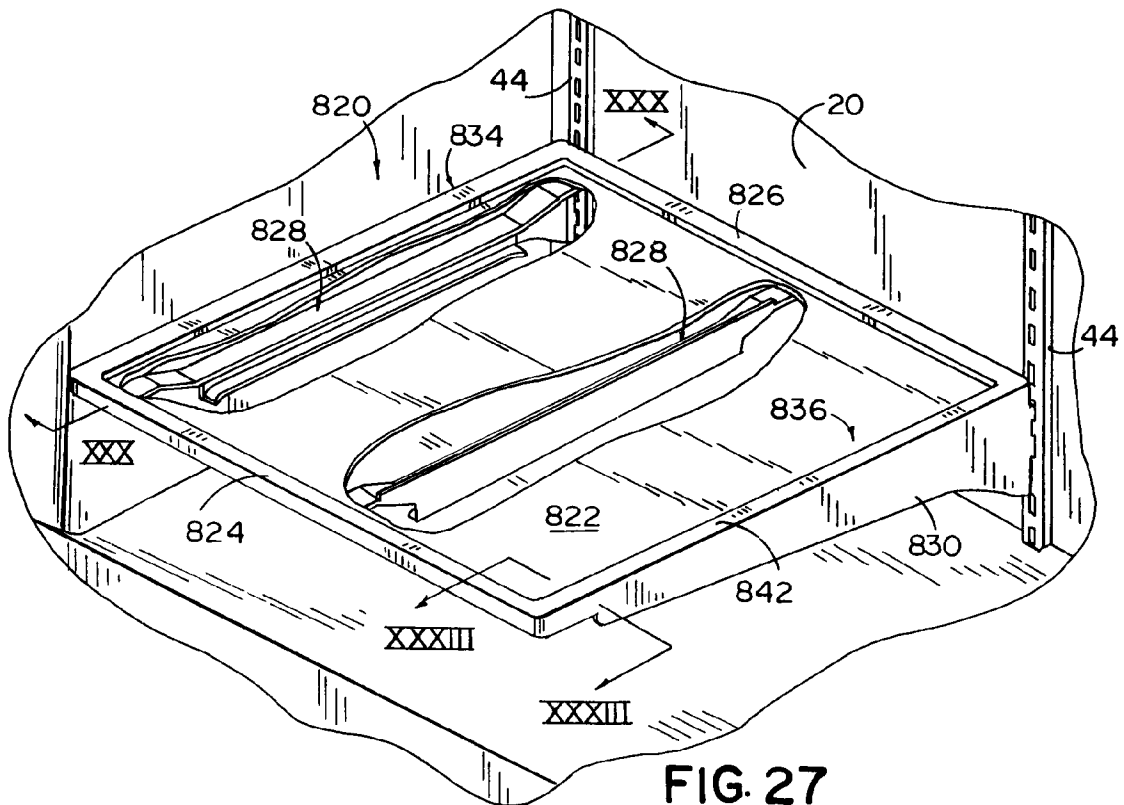
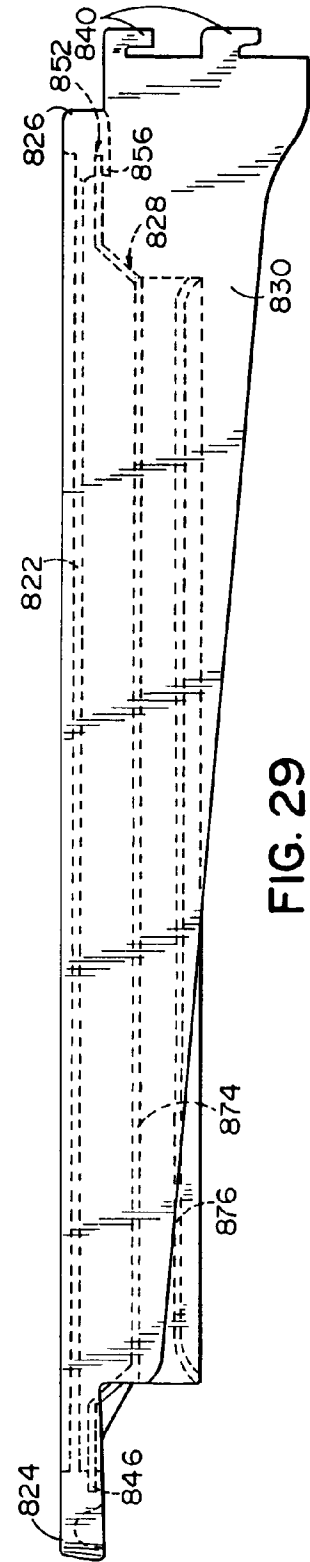
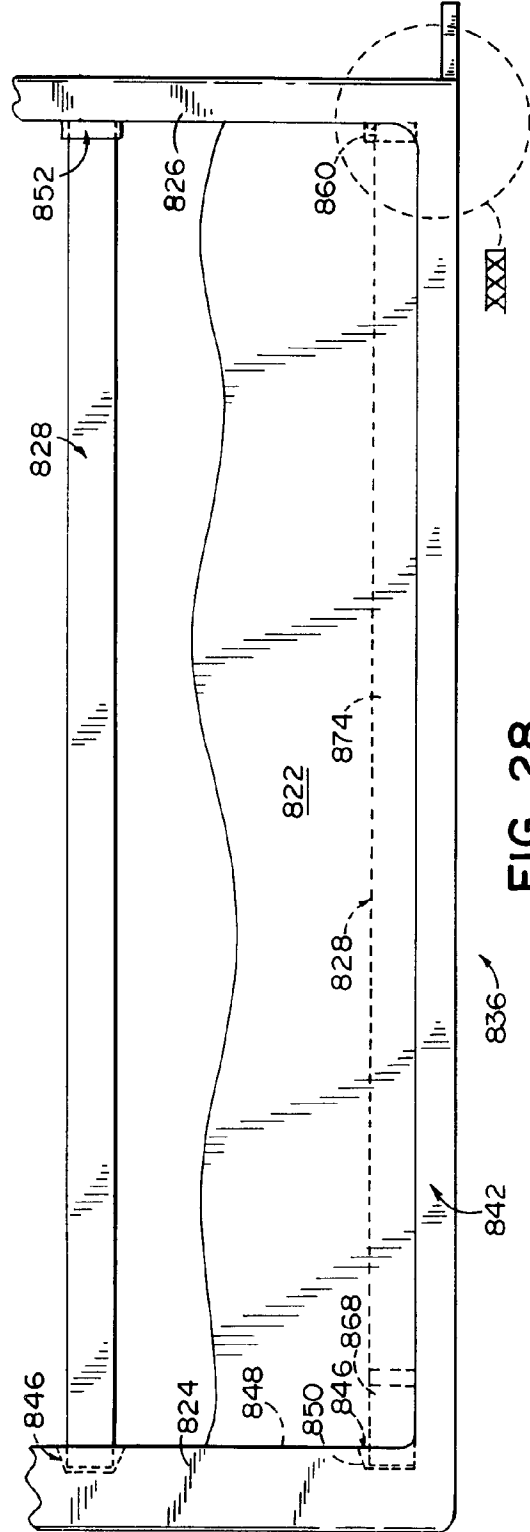


FIG. 24







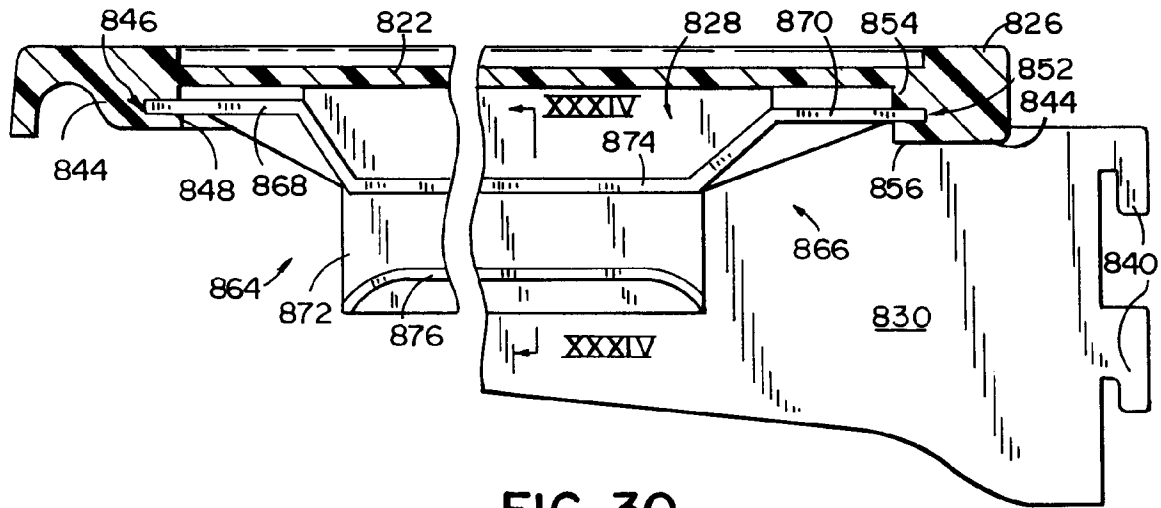


FIG. 30

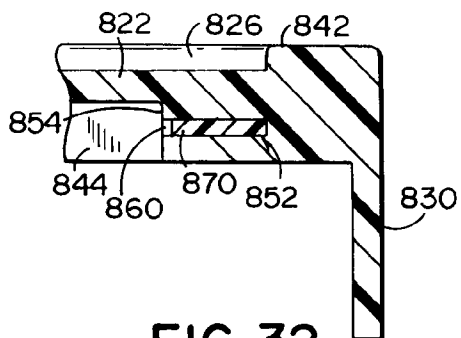


FIG. 32

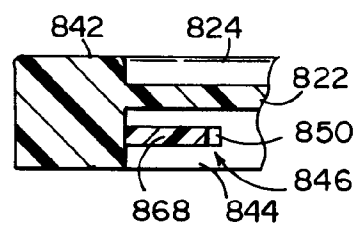


FIG. 33

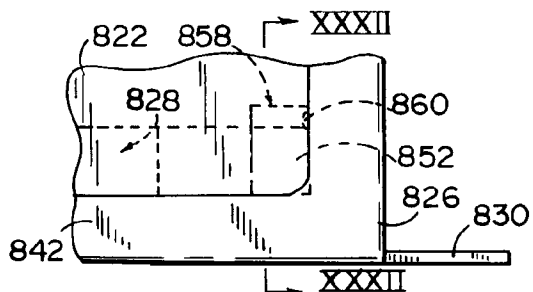


FIG. 31

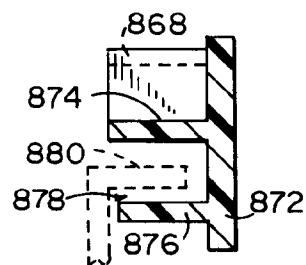


FIG. 34

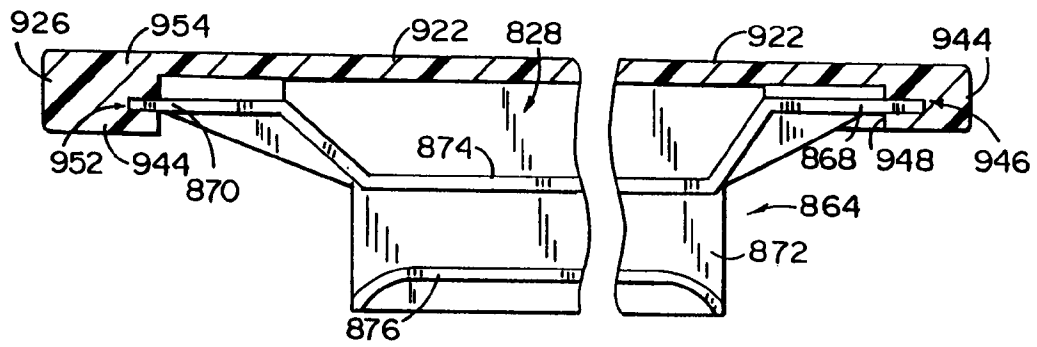


FIG. 36

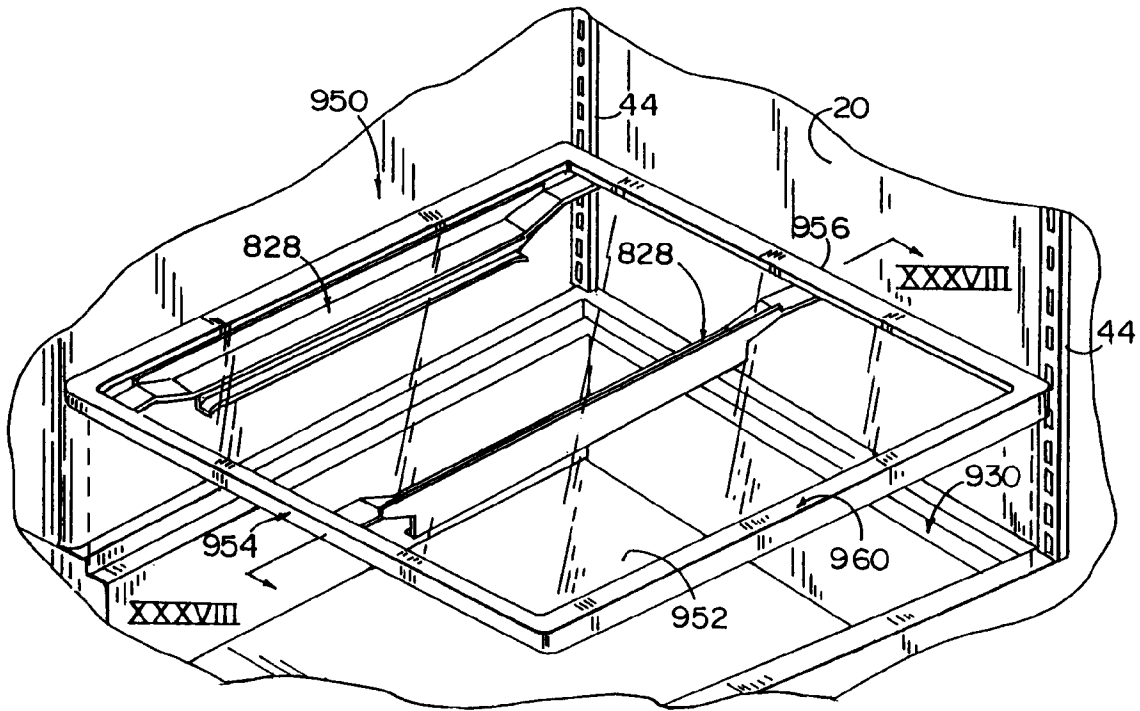


FIG. 37

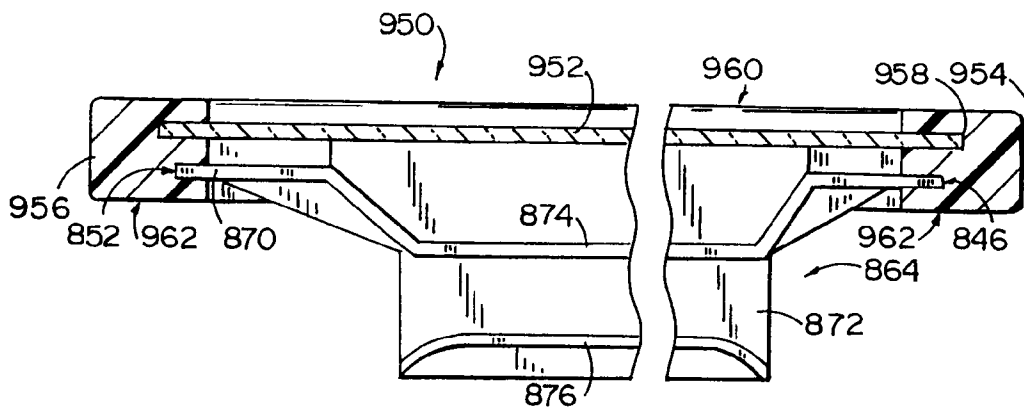


FIG. 38



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 93 30 4073

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X A	US-A-5 044 704 (BUSSAN ET AL) * the whole document * ---	1,2,5-10 3,4	F25D25/02
X A	US-A-4 729 613 (TROMBLE ET AL) * the whole document * ---	1,2,3,10 4,9	
A	US-A-3 108 455 (HANSON) * the whole document * ---	1,2,3	
A	US-A-3 063 772 (KENNEDY) ---		
A	EP-A-0 327 933 (LICENTIA PATENT-VERWALTUNGS-GMBH) ---		
A	DE-U-9 011 291 (BOSCH-SIEMENS HAUSGERÄTE GMBH) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			F25D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 05 OCTOBER 1993	Examiner SILVIS H.
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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