

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This is a continuation-in-part application of pending Application Serial No. 10/355,136 filed January 31, 2003 in the names of Craig Bienick et al. entitled Refrigerator Compartment Housing Vertically Adjustable Shelves, and now U.S. Patent No. _____.

BACKGROUND OF THE INVENTION

[0002] This invention relates to shelving particularly for refrigerators, but is equally adapted for utilization in a variety of different environments, such as furniture shelves, cabinet shelves, point-of-sale displays, and the like.

[0003] A conventional refrigerator shelf typically includes a substantially planar shelf member, and a pair of metal shelf brackets connected to the shelf member, preferably by an injection molded resinous peripheral encapsulation, rim or border. The support brackets typically include a pair of hooks which are received in pairs of slots carried by vertical shelf supports, channels or tracks secured to or forming an integral portion of a rear wall of a refrigerator compartment. The shelves can be step-adjusted along the vertical supports in a convention manner by hooking and unhooking the shelf brackets relative to the vertical supports or tracks. The latter is readily accomplished when the shelf is devoid of any products/articles. However, if relatively heavy products are supported upon the planar shelf member of the shelf, it is not uncommon for the weight and imbalance of the products to cause the shelf and the products thereon to dislodge and/or drop with attendant damage (breakage, spillage, etc.). At times a cantilevered shelf with articles/products thereon is partially unhooked from the vertical support rails of the refrigerator compartment and tilts or cants which causes the articles/products to slide off the shelf with resultant damage even though the shelf itself does not drop. Therefore, cantilevered shelves which are designed to be step-adjusted relative to shelf tracks or channels provided on the rear wall of a refrigerator are susceptible to damage during adjustment, along with the products/articles supported thereon.

SUMMARY OF THE INVENTION

[0004] Accordingly, the present invention provides a refrigerator shelf assembly defined in part by a conventional shelf, namely, a pair of metal support brackets, a planar shelf member, preferably made of clear tempered glass, and an injection molded encapsulation, border or rim unitizing the shelf brackets and the planar shelf member. However, the invention provides a novel adapter bracket utilized in pairs. Each adapter bracket is preferably constructed from metal and includes a first bracket

member having front edges along each of which is a slide-way or channel into which opens a plurality of vertically spaced slots. The rear of each first bracket member is conventionally secured to the rear wall of a refrigerator compartment. Each second bracket member includes a pair of oppositely projecting projections or supports which are vertically spaced from each other a distance corresponding to the slots in the first member. Moreover, the distance between the ends of the second member projections corresponds substantially to the same distance between the channels and is substantially equal to the maximum distance between support edges defined by the vertical slots of the second member. The latter dimensional relationships permit the shelf bracket first and second members, one of which carries the shelf, to be moved upwardly and downwardly in the slideways or channels without being fully disassembled therefrom thereby precluding inadvertent or accidental disassembly of the shelf from the pair of adapter brackets. The second members preferably include slots into which are hooked hooks of the shelf and remain so attached when the shelf is adjusted vertically upwardly or downwardly by sliding of the second members. In this fashion the shelf is never bodily removed from the adapter brackets and the first and second members of the adapter brackets are never bodily disconnected from each other unless done intentionally.

[0005] In further accordance with the invention, the projecting supports of the second members and the slideways and slots of the first member are so related that should the shelf be accidentally released when the second member projections are in the slideways, the weight of the cantilevered shelf, with or without products/articles thereon, tilts or cants the cantilevered shelf forwardly and downwardly which automatically introduces a lowermost of the second member projections into associated slots of the first member which bottom against support edges of the slots and automatically lock the cantilevered shelf in the position of a slight forward tilt. In this manner the entire shelf and the articles/products supported thereon will not drop and most, if not all, products/articles will be retained the glass shelf member thereof.

[0006] The novel shelf assembly and the pair of shelf adapter brackets associated therewith thereby effect limited vertical sliding movement to space shelves different vertical distances from each other but permit the latter to be accomplished without bodily or entirely disconnecting the shelf from the adapter brackets and the adapter brackets from the refrigerator compartment. The latter, with the automatic locking feature latter described, virtually eliminates inadvertent/accidental shelf, shelf assembly, product and/or article; breakage or damage during vertical shelf adjustment.

[0007] Another object of this invention is a novel shelf assembly which can provide incremental vertical adjustment in a conventional refrigerator compartment, be it a freezer compartment or fresh food compartment, absent inadvertent, accidental or undesired downward shelf

movement during vertical adjustment when utilized with one or more trackways formed as integral vertical wall portions of rear or side walls of the refrigerator compartment or as individual trackways fastened to the refrigerator compartment side and/or rear walls. In each case, preferably a pair of vertical trackways extend substantially the entire vertical distance between upper and lower walls of the refrigerator compartment, and the shelf associated therewith can, therefore, be incrementally vertically adjusted substantially the entire vertical height of the associated refrigerator compartment. In the case of a pair of vertical trackways, the shelf includes a pair of shelf support brackets, each carrying a latching pin with each latching pin being vertically adjustable in a slideway of its vertical trackway while being movable into slots or openings of the vertical trackways to interlock therewith and hold the shelf in a substantially horizontal position of use. Preferably, one or more such shelves are supported by and are adjustable relative to the pair of trackways, but, most importantly, the shelves and trackways are so constructed and arranged as to provide a transverse entry/ removal path of travel for the shelf pins, preferably at upper, lower and medial positions along the vertical trackways. The transverse entry/removal path of travel for the shelf supporting pins is defined by a pair of transverse slots in lateral walls of each vertical trackway through which each self bracket pin can transversely enter or leave the slideway and the latching or support openings or slots associated therewith. The latter is particularly important openings or slots associated therewith. The latter is particularly important because it maximizes the vertical adjustment of the shelf assembly, particularly adjacent an associated top wall of the refrigerator compartment. Therefore, not only are the trackways and shelves specifically designed with the automatic locking feature earlier described, but one or more shelves can be transversely assembled to or disassembled from the trackways at at least three locations to maximize refrigerator storage compartment capacity while facilitating removal and disassembly for a variety of purposes, such as cleaning, repositioning, etc.

[0008] In further accordance with this invention, in the case of separate vertical trackways which are fastened to interior walls of a refrigerator compartment, each trackway is preferably of a U-shaped transverse cross-sectional configuration defined by a bight wall and lateral walls with each of the lateral walls defining a slideway of a predetermined size and more closely adjacent elongated terminal edges. The trackways open in a direction away from the refrigerator compartment rear wall and include openings for fastening the same to either opposite side walls and/or the rear wall of the refrigerator compartment. Such openings need not be provided should the trackways constitute integral vertical wall portions of, for example, the refrigerator compartment rear wall. However, in either case, the forwardmost terminal lateral edges of the lateral wall are relieved by an opening or a slot in each immediately adjacent the compartment top wall,

somewhat less adjacent the compartment bottom wall, and if desired at a position therebetween. Since the shelf brackets of the shelf carry pins at uppermost edges thereof, an uppermost shelf can be assembled through the uppermost access openings immediately adjacent the top wall of the refrigerator compartment and can be vertically adjusted as need be thereafter, or removed therefrom in a like manner along, a substantially transverse path of travel relative to the vertical slideways of the trackways. The lowermost access openings are spaced above the bottom wall of the compartment at a point at which the locking or latching slots of the trackways are immediately accessible and thereby define the lowest shelf position of the refrigerator compartment.

[0009] A further object of this invention is to provide a novel bracket which defines a vertical trackway having a plurality of vertically spaced latching slots for selecting latching engagement with a vertically adjustable shelf which is adapted to be selectively latched along the vertical trackway. The vertical trackway is defined by at least two elongated legs and an elongated bight wall therebetween, the plurality of latching slots being defined in the two elongated legs, and a plurality of vertically spaced stop projections disposed along the bight portion of the trackway to reduce inadvertent/accidental downward travel of a travel member therealong.

[0010] A further object of this invention is to provide a novel trackway bracket including at least one inwardly directed projection at a bottom of the trackway bracket for precluding disassembly of a travel member relative to the trackway by vertical downward movement of the travel member relative to the trackway toward a lowermost end of the trackway.

[0011] Another object of this invention is to provide a novel trackway bracket defining a trackway in which the bight wall of the trackway bracket carries a plurality of hooks for hooking the trackway bracket to selected ones of vertically spaced slots in a pair of refrigerator compartment trackways.

[0012] With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIGURE 1 is a perspective view of a refrigerator, a refrigerator compartment thereof and a novel shelf assembly of the invention defined by a shelf having an injection molded encapsulation or rim unitizing a tempered glass shelf member to a pair of metal shelf support brackets, and a pair of shelf adapter brackets each defined by first and second bracket members, each of the first bracket members being secured to a rear wall of the refrigerator compartment and having opposing slideways and a plurality of vertically spaced slots therein, and a second bracket member having oppositely directed pro-

jecting supports received in the slots and additionally having slits or slots receiving hooks of the metal shelf support brackets.

[0014] FIGURE 2 is an enlarged fragmentary cross-sectional view taken generally along line 2-2 of Figure 1, and illustrates the injection molded rim encapsulating and unitizing a peripheral edge of the glass shelf member and an upper edge of one of the metal shelf support brackets.

[0015] FIGURE 3 is a fragmentary exploded view of one of the shelf adapter brackets, and illustrates details of the slideways and slots of the first shelf bracket member, oppositely directed projecting supports and slits of the second shelf bracket member and hooks of the shelf.

[0016] FIGURE 4 is a fragmentary side elevational view of one of the shelf adapter brackets, and illustrates the manner in which the oppositely directed projections of the second shelf bracket member are seated in the slots of the first shelf bracket member and hooks of the shelf support are received in slits of the second shelf bracket member

[0017] FIGURE 5 is an enlarged top plan view of each shelf adapter bracket of Figure 1, and illustrates the manner in which the projecting supports of the second shelf bracket member slide in the slideways of the first shelf bracket member to effect vertical sliding adjustment therebetween.

[0018] FIGURE 6 is a side elevational view of the shelf adapter bracket of Figure 4, and illustrates the manner in which the shelf will automatically lock in a slightly inclined or canted position if inadvertently or accidentally released or dropped when the projecting supports of the second shelf bracket member are in the slideways of first shelf bracket member.

[0019] FIGURE 7 is a fragmentary cross-sectional view taken generally along line 7-7 of Figure 4, and illustrates one of the shelf adapter brackets in the adjusted and locked position thereof.

[0020] FIGURE 8 is fragmentary perspective view of a shelf bracket constructed in accordance with this invention, and illustrates as an integral part thereof a rear member in the form of a second shelf bracket member carrying oppositely directed supporting projections.

[0021] FIGURE 9 is a fragmentary cross-sectional view taken generally along line 9-9 of Figure 10, and illustrates the shelf bracket having a glass panel member unitized thereto by an injection molded rim or encapsulation and the oppositely directed supporting projections thereof seated in slots of an associated first shelf bracket member conventionally secured to a wall of the refrigerator compartment.

[0022] FIGURE 10 is a fragmentary side elevational view of the shelf and shelf adapter bracket of Figure 9, and illustrates the interlocked relationship between the first and second shelf bracket members thereof to achieve desired vertical adjustment.

[0023] FIGURE 11 is a top perspective view of another shelf adapter bracket of the present invention and illustrates one of the second shelf bracket members of Figure

1 integrally unitized to a shelf by an injection molded encapsulation or rim at a reinforced corner thereof.

[0024] FIGURE 12 is a fragmentary top plan view looking downwardly in Figure 11, and illustrates oppositely directed projecting supports of the second shelf bracket member.

[0025] FIGURE 13 is an enlarged fragmentary cross-sectional view taken generally along line 13-13, and illustrates the manner in which the shelf bracket member is unitized to the shelf by the injection molded encapsulation or rim at the corner thereof.

[0026] FIGURE 14 is an enlarged fragmentary perspective view of another shelf adapter bracket, and illustrates a first shelf bracket member having opposing channels or slideways and vertically spaced slots and a second shelf bracket member locked thereto and supporting a shelf.

[0027] FIGURE 15 is a vertical cross-sectional view taken generally along line 15-15 of Figure 14, and illustrates the interlocked relationship between the first and second shelf bracket members, and integral hooks of a shelf carried by one of the second shelf bracket members.

[0028] FIGURE 16 is a fragmentary exploded view of the shelf and second shelf bracket member of Figures 14 and 15, and illustrates details thereof.

[0029] FIGURE 17 is a perspective view of a refrigerator, including a refrigerator compartment thereof, and another novel shelf assembly of the invention, and illustrates a shelf having an injection molded encapsulation or rim unitizing a tempered glass shelf member to a pair of metal shelf support brackets and a pair of vertical slotted brackets or trackways each of a generally U-shaped transverse cross-sectional configuration defined by a bight wall and a pair of spaced lateral walls each defining a slideway which can be accessed by latching pins of the shelf support brackets by means of uppermost and lowermost slots or openings formed in the lateral walls of each trackway.

[0030] FIGURE 18 is a fragmentary exploded front elevational view of one of the brackets or trackways of Figure 17, and illustrates in more detail the access openings of the lateral walls of the trackway opening into the slideway along which the shelf can be moved vertically upwardly and downwardly therealong to a desired position of final adjustment,

[0031] FIGURE 19 is fragmentary cross-sectional view taken along line 19-19 of Figure 18, and illustrates one of several vertically spaced downwardly opening rearwardly projecting hooks and a forwardly directed protrusion or projection formed from the bight wall for respectively securing the bracket to slotted trackways of a refrigerator compartment and preventing inadvertent/accidental downward travel of the shelf.

[0032] FIGURE 20 is a fragmentary enlarged cross-sectional view taken generally along line 20-20 of Figure 17, and illustrates one of the trackway brackets hooked in slots of the refrigerator compartment trackway.

[0033] FIGURE 21 is an enlarged cross-sectional view

taken along line 21-21 of Figure 20, and illustrates the generally forwardly opening U-shaped transverse cross-sectional configuration of the trackway or trackway bracket, including lateral walls defining the slideway, a forwardly and rearwardly projecting shelf stop and a bracket supporting hook former from the material of the bight wall of the trackway, and bottom stop flanges formed from the material of the lateral walls.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0034] A novel refrigerator shelf assembly constructed in accordance with the present invention is generally designated by the reference numeral 10, and is illustrated in Figure 1 in association with a cabinet or compartment C of a refrigerator R.

[0035] The shelf assembly 10 includes a shelf 15 defined by opposite substantially parallel metal shelf brackets 16, 17 unitized to a peripheral edge (unnumbered) of a shelf member 18 of tempered glass by an injection molded encapsulation, rim or border 20 (Figure 2) formed in accordance with the method disclosed in U.S. Patent No. 5,362,149 granted on November 8, 1994 to Bird et al., the totality of which is incorporated hereat by reference. Each of the metal support brackets 16, 17 includes conventional downwardly directed hooks 21, 22 which normally engage in vertically disposed parallel shelf tracks in a conventional refrigerator compartment, as is fully disclosed in the latter-identified patent. Such conventional shelves 10 can be hooked to, completely unhooked from and re-hooked to the slots of the shelf tracks to effect step-wise vertical adjustments of the shelves relative to other shelves and/or top and bottom walls of an associated refrigerator compartment. However, a disadvantage of such total disconnection noted earlier herein between conventional shelf hooks and conventional Vertical shelf tracks can result in advertent or accidental shelf and/or product droppage and result in damage or breakage. The latter is precluded by the novel refrigerator shelf assembly 10 of the present invention.

[0036] The shelf assembly 10 further includes a pair 25, 25 (Figure 1) of identical shelf adapter brackets, each defined by a first shelf bracket member 26 and a second shelf bracket member 27 (Figures 3-5). Each first shelf bracket member 26 of the pair 25, 25 of shelf bracket adapters is of a generally U-shaped transverse cross section (Figures 5 and 7) and is preferably constructed of relatively rigid metallic sheet material stamped, blanked and formed to the specific configuration best illustrated in Figure 3 of the drawings. Each U-shaped first bracket member includes a bight wall or bight portion 28 and opposite legs or leg portions 29 30. Each leg 29, 30 includes a relatively straight front edge or edge portion 31, a top edge or edge portion 32 and a bottom edge or edge portion 33. The bight portion or wall 28 has a plurality of openings 34 (Figures 5, 6 and 7) for securing each of the first bracket members 26, 26 to a rear wall

13 of the refrigerator compartment C, as is readily apparent Figure 1 of the drawings.

[0037] Each of the legs 29, 30 of each of the first shelf bracket members 26, 26 is provided with a vertical slideway or channel 41 immediately adjacent each front edge 31 and substantially parallel thereto. Each slideway 41 is of a generally U-shaped transverse cross section (Figures 3, 5 and 7) and is defined by a first leg or leg portion 42 most adjacent each front edge 31, a second leg or leg portion 43 and a bight portion 44 therebetween. The legs or leg portions 42, 43 are in diverging relationship to each other in a direction away from the bight portion 44. Each slideway or channel 41 includes a narrowest transverse width W which increases in the opening direction of the slideways 41, 41. Each leg portion 43 also blends with a medial portion 45 (Figures 3-7) of each of the legs 29, 30.

[0038] A plurality of identical vertically spaced support means 50 in the form of slots or openings 50 are formed along the length of the medial portion 45 of each of the legs 29, 30 between the upper edge 32 and the lower edge 33 thereof. Each slot 50 includes a front vertical edge 51, a rear vertical edge 52 and a slightly curved top edge 53. The edges 51, 52 are substantially parallel to each other and are parallel to the front edge 31 of the associated legs 29, 30. A lower edge or ledge of each slot 50 includes a lowermost substantially horizontally disposed edge or ledge 54 defining means for supporting projecting supports or projections 60 of each of the second bracket members 27, as will be described more fully hereinafter. A curved transition edge or ledge 55 extends from each edge 51 to each edge 54 beginning at a point midway in the bight portion 44 of each slideway 41, continuing along the ledge portion 43 and ending at a merge point (unnumbered) with the supporting ledge or edge 54 (Figures 3-7).

[0039] The purpose and function of the transition edges or ledges 55 of the legs 29, 30 of each of the first shelf bracket members 26 is to permit the projecting supports, projections or pins 60 of the second shelf bracket members 27 ready entry from the associated slideways 41, 41 toward and downwardly upon the support edges or ledges 54 of the slots 50 and the like ready removal thereof in an opposite direction for purposes of assembling or vertically slidably adjusting the shelf 15 relative to the first bracket members 26 by sliding the second bracket members 27 vertically relative thereto.

[0040] As is best illustrated in Figures 3 through 5 of the drawings, the second shelf bracket member 27 of each of the pairs 25, 25 of adapter brackets is also of a generally U-shaped transverse cross-sectional configuration, and is preferably also constructed of relatively rigid sheet metal material blanked, stamped and formed to the configuration best illustrated in Figures 3 and 5 of the drawings. Each second shelf bracket member 27 includes a bight wall 68 and oppositely substantially parallel legs 69, 70 which converge toward each other and terminating in substantially parallel end edges or edge portions 71, 72, respectively. The end edges 71, 72 each

have a plurality of vertically spaced openings 73 (Figures 4 and 5) through which injected polymeric/copolymeric plastic material can pass during the formation of slide members 74 (Figure 3) on outer surfaces (unnumbered) of the terminal end portion 71, 72 and enlarged heads 75 (Figure 5) on inboard surfaces (unnumbered) of the terminal edges 71, 72. Slots 81, 82 (Figures 3 and 5) are formed in the bight wall 86 of each second shelf bracket member 27 for receipt therein of the hooks 21, 22 of the shelf 15. The pins or projections 60 have a maximum diameter D (Figure 5) increasing from the narrowest transverse width W of the slideways 41, 41 to the maximum width thereof to permit relative vertical sliding movement therebetween during which the glide members 74, 74 engage inner surfaces (unnumbered) of the legs 29, 30 of the first bracket members 26, as is best illustrated in Figures 5 and 7 of the drawings.

[0041] As is best illustrated in Figure 5 of the drawings, the oppositely projecting pins 60, 60 carried by each second shelf bracket member 27 are spaced from each other a maximum effective distance D1 which is slightly less than an effective distance D2 measured between the bight portions 44 of the slideways 41. Because of the slight difference in the distances D1, D2, the projecting pins or projecting supports 60 move readily easily vertically upwardly and downwardly within the slideways 41. Therefore, during initial installation after each of the first bracket members 26, 26 has been secured to the rear wall 13 of the refrigerator compartment C with the slots 50, 50 thereof in horizontal alignment, the pins 60 can be introduced into the slideways 41 from above or below. This can be done by first hooking the hooks 21, 22 into the respective slots 81, 82 of the second shelf bracket members 27 and thereafter simultaneously introducing the latter from the bottom or from the top into the first shelf bracket members 26, 26. Alternately, the shelf 15 need not be connected through its hooks 21, 22 to the slots 81, 82 of the second shelf bracket members 27 but instead the latter can be individually or simultaneously introduced into the first bracket members 26 via the slideways 41 and when horizontally aligned, the second shelf bracket members 27 are simply pushed inwardly in a direction toward the bight walls 28 of the first shelf bracket members 26. As the second shelf bracket members 26 are pushed inwardly, the projecting pins 60 thereof engage and are guided downwardly by the upper edges 53 and/or by the lower edges 55 of a pair of the slots 50. Since the slideways 41, 41 of each of the first bracket members 26, 26 oppose each other, the leg portions 43 thereof are in converging relationship to each other in a direction away from the front edges 31, 31 of the legs 29, 30 and toward the bight wall 28 (Figure 5). Therefore, during the inward movement of the supporting pins 60 from within the slideways 41 (Figure 5), the pins 60 move along the converging edges or ledges 55 of the converging walls 43, 43 (Figure 5) progressively inward from the outermost distance D2, measured across the bight walls 44, 44 of the slideways 41, 41 to a distance D3 (Figure

5) which is the maximum distance between the horizontally adjacent supporting edges 54. In this manner the transition edges 55, 55 (Figure 7) of horizontally adjacent slots 50, 50 in the legs 29, 30 of each of the first shelf bracket members 26, 26 contact and guide the associated pins 60, 60 from the slideways 41, 41 toward and upon the supporting edges 54 (Figures 4 and 7) and conversely away from the supporting edges 54 and into the slideways 41 for disassembly purposes.

[0042] It is to be particularly noted that during any of the vertical adjustment just described of the shelf 15 when attached to the second shelf bracket members 27, 27, and specifically during the movement of the latter along the slots 50 and the slideways 41, there is no total or complete disassembly of the shelf 15 relative to the second shelf bracket members 27 or any total disassembly of the second Shelf bracket members 27 relative to the first shelf bracket members 26. Therefore, during vertical adjustment of the shelf 15, when connected to the second shelf bracket members 27, it is extremely unlikely that the shelf 15, with or without products/articles thereon, will be inadvertently dropped or tilted because during any such adjusting movement the projecting pins 60, 60 are at all times in contact with portions of the first shelf bracket members 26, be it through the slots 50, 50 or the slideways 41, 41 thereof. It is only upon moving the projecting pins 60 upwardly or downwardly along their associated slideways 41 that the shelf 15 can accidentally drop substantially vertically if released, and only upon the removal of all three projecting pins 60 from each slideway 41 could the shelf 15 drop to the bottom of the compartment C, though the latter is virtually impossible for reasons explained immediately hereinafter.

[0043] Reference is made to Figure 6 of the drawings which illustrates the position of the shelf 15' after it has been introduced from above by inserting each second shelf bracket member 27, 27 into an associated first bracket member 26, 26 with the projecting pins 60 disposed in the slideways 41. With the uppermost pins 60, 60 of each second shelf bracket member 27 are immediately adjacent the upper edges 32 of each first shelf bracket members 26, it is assumed that the shelf 15' is accidentally released/dropped. Since the shelf 15' is cantilevered, even absent products or articles supported thereon, its weight Wt (Figure 6) will effect downward movement and vertical pivoting and/or tilting movement. In other words if the shelf 15' were released from the uppermost assumed position, it would begin to fall vertically because of gravity acting upon its weight Wt, but since the shelf 15' is cantilevered, it will also pivot, tilt or cant in a counterclockwise direction, as is indicated by the curved line of travel A associated therewith in Figure 6 bringing the uppermost projecting pins 60 into bearing engagement with the front leg portions 42 of the slideways 41 and the lowermost projecting supports or pins 60 into bearing engagement with the rear leg portions 43 at the slideways 41. If the slots 50 did not project into the bight portions 44 of the slideways 41, the shelf 15' would

most assuredly continue a downward slide while being slightly cocked or tilted with the uppermost and lowermost projecting supports 60, 60 bearing against the respective front and rear leg portions 42, 43 of the slideways 41 until dropping out the bottom thereof. However, since the slots 50 include the ledge or edge portions 55 (Figures 4 and 5) which begin within the medial portion 44 of each slideway 41, the lowermost projecting supports 60 (Figure 6) eventually reach the slots 50, devoid of the Inner leg portions 43, which allows the projecting supports 60 to progressively enter horizontally aligns slots 50 guided by the transition edges 55, as is readily visualized in Figure 6, until eventually fully overlying the transition edges 55 thereof which guide the lowermost projecting supports 60 toward and upon the horizontal supporting edges 54. Thus, the shelf 15' can be adjusted along the slideways 41 to any one of a number of vertically desired positions of adjustment absent fear of disengagement of the second shelf bracket members 27 from the first shelf bracket members 26. The latter function is extremely important because even under a worse case scenario, the shelf 15' will not drop from the first bracket members 26 and will tilt substantially no worse than that illustrated in Figure 6 of the drawings. Even should the latter occur while articles or products are being supported upon the shelf 15', a person most likely could prevent the articles/ products from falling because both hands could be utilized for the latter purpose, as opposed to being used to essentially simultaneously catch and/or the shelf 15' and the articles/products supported thereupon.

[0044] Another novel refrigerator shelf assembly constructed in accordance with the present invention is illustrated in Figures 8 through 10 of the drawings and is generally designated by the reference numeral 10". All the structure and components of the refrigerator shelf assembly 10" which are structurally identical to or equivalent to the refrigerator shelf assembly 10 of Figures 1 through 5 of the drawings bear the same reference numerals and reference characters but are double primed.

[0045] The refrigerator shelf assembly 10" includes a shelf 15" formed by two metal shelf supporting brackets of which only the shelf supporting bracket 17" is illustrated. A shelf member 18" of tempered glass and an injection molded encapsulation, rim or border 20" unitize the latter components which can be hooked, re-hooked and vertically adjusted relative to a first bracket member 26". Therefore, the overall shelf assembly 10" is identical to the shelf assembly 10 except that in lieu of the separate second shelf bracket member 27, the shelf bracket support 17" and the opposite equivalent unillustrated metal shelf bracket support, are each provided with a second shelf bracket member 90 which is an integral part of the shelf supporting bracket 17" (Figure 8). The shelf bracket 17" is slit longitudinally, blanked, stamped and formed to define an upper leg 91, a medial leg 92, and a lower leg 93. The upper and lower legs 91, 93, respectively, are offset to one side of a vertical plane of the shelf bracket 17" while the medial or central leg 92 is offset an equal

amount to an opposite side of a vertical plane through the shelf bracket 17" resulting in the generally U-shaped configuration when viewed from above or below (Figure 9). The legs 91 through 93 include projecting supports or projecting pins 94 through 96, respectively. The projecting supports 94, 96 project away from and axially opposite to the direction of projection of the projecting support 95, as is most apparent from Figure 9. The vertical spacing between the projecting supports 94, 95; 95, 96 correspond to the vertical spacing between the slots 50" of the first shelf bracket member 26".

[0046] As in the case of the shelf 15, the shelf 15" can be inserted into the first shelf bracket member 26" from above or below by simply introducing the projecting supports 94 through 96 in the associated slideways 41", 41" (Figure 9) and positioning the projecting supports 94 through 96 in three desired slots 50", as is illustrated in Figure 10. Structurally and functionally the shelf assemblies 10, 10' are virtually identical except for the fact that by constructing the shelf support 17" and the second shelf bracket member 90 as a single one-piece component from a single piece of metallic material, the overall, expense of manufacture of the shelf assembly 10" is appreciably lessened as compared to that of the shelf assembly 14.

[0047] Another shelf assembly constructed in accordance with this invention is illustrated in Figures 11 through 13 of the drawings and is generally designated by the reference numeral 100. The shelf assembly 100 is similar in structure and is substantially identical in function to the shelf assembly 10 and at each of two rear corners (unnumbered) of an injection molded encapsulation, border or rim 120, there is a second shelf bracket member 127 which is substantially identical to the second shelf bracket member 27 (Figure 3) and functions in the manner heretofore described with respect to an associated one of a pair of first shelf bracket members 26 to adjust the shelf 150 vertically in a refrigerator compartment. The shelf assembly 100 differs from the shelf assembly 10 in that the shelf 150 excludes metallic shelf brackets corresponding to the shelf brackets 16, 17, and in lieu thereof the injection molded encapsulation, border or rim 120 integrally unitizes or unites a shelf member 118 of tempered glass to the second shelf bracket member 127 at each of the two rear corners of the rim 120 during the injection molding of the rim 120 which causes the injection molded polymeric/copolymeric material thereof to fuse across a plurality of slots 181 through 183 (Figure 13). With one of the second shelf bracket members 127 at each corner of the shelf 150, oppositely directed projections 160 thereof function with respect to slideways 41 and slots 50 of associated first shelf bracket members 26 in the manner heretofore described relative to the shelf assembly 10.

[0048] Another refrigerator shelf assembly constructed in accordance with the invention is illustrated in Figures 14 through 16 of the drawings and is generally designated by the reference numeral 210. Structure the shelf

assembly 210 which is structurally or functionally equivalent to the shelf assembly 10 is identified by identical reference numerals preceded by 200, such as a shelf 215 defined by a shelf member 218 of tempered glass which is encapsulated along a peripheral edge (unnumbered) thereof by an injection molded encapsulation, rim or border 220 which at opposite rear corners (unnumbered) includes downwardly directed relatively rigid integral hooks 216, each of which includes a centrally located, downwardly projecting, thinner flexible latching or locking tab 300 having a locking ledge 305 and a finger/thumb tab 310 (Figure 15). Each hook 216 hooks over and behind a front wall 301 of a second shelf bracket member 227 constructed from molded polymeric/copolymeric synthetic plastic material. Each of the two second shelf bracket members 227, of which only one is illustrated, is adapted for introduction into and can be vertically adjusted relative to a first shelf bracket member 226 (Figure 14) also constructed from synthetic polymeric/copolymeric plastic material. Each second shelf bracket member 227 includes a pair of vertically spaced oppositely directed projecting supports or supporting pins 260 (Figures 15 and 16) which slide in associated slideways 241 (Figures 14 and 15) which open toward each other in opposite legs 229, 230 (Figure 14) of each first shelf bracket member 226. Each leg 229, 230 includes a front edge or front flange 231 with the flanges 231, 231 being in opposing relationship to each other and in part each defining one of the slideways 241 which extend the entire vertical length of the first shelf bracket member 226. Each of the legs 229, 230 is molded to define a plurality of slots 250 having surfaces, edges and/or ledges corresponding to like structure of each slot 50 which has been identified by reference numerals 252 through 255. The projecting supports 260 of each second shelf bracket member 227 cooperate with the slots 250 of each of the two first shelf bracket members 226, 226 precisely in the manner set forth with respect to the operation of the respective first and second shelf bracket members 26, 27 of the two pair of adapter brackets 25 heretofore described relative to Figures 1 through 7 of the drawings which are incorporated hereat by reference. Obviously, a major difference between the latter two constructions is that the slots 50 are "open," i.e., pass through the legs 29, 30 whereas the slots 250 are "closed," i.e., do not pass through the legs 229, 230. The latter may at times be considered preferable for aesthetic purposes inasmuch as the slots 250 are essentially hidden by the legs 229, 231. Furthermore, the outer surfaces (unnumbered) of the legs 229, 230 of the first shelf bracket member 226 are relatively flat and uniplanar which might also be considered to be more aesthetic than the undulating exterior configuration of the legs 29, 30, particularly in the area of the slideways 41 thereof. However, both shelf assemblies 10, 210 function identically with respect to vertical adjustment and the prevention of inadvertent or accidental shelf droppage in the manner heretofore described with respect to the shelf 15' of Figures 6 and 7. In the case of the shelf 215, should

the latter tend to pivot, tilt or cant clockwise under its weight Wt' , as viewed in Figures 14 and 15, when the projecting supports or pins 260 are in the slideways 241, the upper projecting supports or pins 260 will contact the front flanges 231, 231 of the legs 229, 230 which limit the tilting of the shelf 215 and the eventual introduction of the lowermost projecting supports or pins 260 into the slot 250 to achieve the orientation of the shelf 215 corresponding to the shelf 15' of Figure 6.

[0049] After each hook 216 of the shelf 215 has been hooked upon the front wall 301 of the associated second shelf bracket member 227, the locking nose or ledge 305 of each locking tab 300 engages beneath and locks with a lower edge 306 of each second shelf bracket member 227 to prevent the shelf 215 from being inadvertently or accidentally withdrawn or removed from the second shelf bracket members 227, as is readily apparent from Figure 15. The locking function, is achieved by simply sliding each hook 216 downwardly into each second bracket member 227 which automatically prevents disengagement therebetween until desired by a person pushing the finger/thumb tabs 310 to the left, as viewed in Figure 15, to effect disengagement of the hooks 216, 216 from the walls 301, 301 of the second shelf bracket members 227, 227.

[0050] Another novel refrigerator shelf assembly constructed in accordance with the present invention is illustrated in Figure 17 of the drawings and is generally designated by the reference numeral 510. Components of the shelf assembly 510 which correspond to the like components of the shelf assembly 10 have been prefixed by "500" to identify identical structure without specifically describing the same. For example, as in the case of the shelf assembly 10, the shelf assembly 510 includes a shelf 515 defined by opposite substantially parallel metal shelf brackets 516, 517 unitized to a peripheral edge (unnumbered) of a shelf member or panel 518 of tempered glass by an injection molded encapsulation, rim or border 520 formed in accordance with the method disclosed in U.S. Patent No. 5,362,149. However, as opposed to the metal support brackets 16, 17 of the shelf assembly 10, each metal shelf bracket 516, 517 the shelf assembly 510 includes at a rearmost end portion (unnumbered) thereof latch means or pin means 560 (Figure 17) for effecting vertical stepwise adjustment with respect to vertically spaced support means, slots or openings 550 of vertical brackets/trackways 526, 526 corresponding substantially identically to the first shelf bracket member 26 earlier described. Each metal shelf bracket 516, 517 further includes lateral stabilization means 539 (Figure 17) for intimately slidably engaging vertical terminal side edges or walls 531, 531 of trackway side walls 542, 542 of the trackways 526 to reduce sidewise or lateral shelf movement in any adjusted position of the shelf 515 during vertical upward or vertical downward adjustment thereof with respect to the trackways 526, 526.

[0051] Each metal shelf bracket 516, 517 further includes lubricity providing means 540 (Figure 17) in the

form of a block of plastic material having a very low coefficient of friction and excellent lubricity which thereby reduces frictional forces during sliding adjustment of the shelf 515 upwardly or downwardly with respect to the trackways 526, 526 particularly as the lubricity block 540 slides in intimate contacting relationship with the inner vertical side edges or walls 531, 531 of the side walls 542, 542 of each of the trackways 526 (Figure 17).

[0052] Details of the pin means 560, the stabilizing means 539 and the lubricity means 540, as well as the functions performed thereby, are fully disclosed in Applicant's pending application Serial No. filed on and entitled "Vertically Adjustable Shelves and Refrigerator Compartment Housing the Same," the specifics of which are incorporated hereat by reference.

[0053] Each of the trackways 526, 526 also includes means 534 (Figures 19, 20 and 21) for securing the trackways 526, 526 directly to conventional side walls (not shown) and/or a rear wall RW of a conventional fresh food compartment or freezer compartment C1 of a conventional refrigerator R1 (Figure 17) which also includes top and bottom wall (also not shown). In Figure 17, the rear wall RW of the compartment C1 has a pair of conventional vertical trackways T, T formed by slots S, S which extend or run the entire distance between the top and bottom walls. In a conventional refrigerator, a shelf having hooks is vertically adjusted in the compartment C1 by hooking a pair of hooks of each shelf bracket in a pair of slots S, S of each of the vertical tracks T, T. However, if conventional shelf is being adjusted relative to the tracks T, T, particularly with products (not shown) supported thereupon, and the shelf is tilted or dropped, product breakage/spillage can easily result. However, by utilizing the trackways 526, 526 of the present invention in association with the conventional trackways T, T, such inadvertent/accidental damage is precluded incident to shelf adjustment due to the operation of the shelf assembly 510 corresponding to that heretofore described specifically with respect to Figure 6 of the drawings and the shelf assembly 10 and illustrated therein. In order to achieve the foregoing objects, the trackways 526, 526 can be relatively short in length (9" - 12") or longer (12" - 24") or can correspond in length substantially to the entire distance between the top and bottom walls of the compartment C1. In this manner any conventional refrigerator compartment C1 having trackways T, T can be readily converted to utilize the shelf assembly 510 therewith to obtain the advantages heretofore described.

[0054] It is also to be understood that the top and bottom walls of the refrigerator compartment are not necessarily the uppermost or lowermost interior walls of the compartment C1 of the refrigerator R1. For example, the top wall can be the bottom wall of an upper separately front-accessible freezer compartment (not shown), while the bottom wall can be the upper wall of an inner crisper compartment accessed by an inner door sliding therebeneath. Rather, the compartment C1 is intended to illustrate the major of a conventional fresh food compartment

or a frozen food compartment in which one or a plurality of the shelves 515 are mounted for vertical distance adjustment within the trackways 526, 526 through substantially any vertical distance desired by appropriately selecting appropriate lengths of the trackways 526, 526.

[0055] Each bracket, trackway bracket or trackway 526, 526 is of a generally U-shaped transverse cross section (Figure 21) and is preferably constructed of relatively rigid metallic sheet material stamped, blanked and formed to the specific configuration best illustrated in Figure 21 of the drawings. Each U-shaped trackway includes a bight wall or bight portion 528 and opposite legs or leg portions 529, 530. Each leg 529, 530 includes a relatively straight front edge or edge portion 531, a top edge or edge portion 532 and a bottom edge or edge portion 533. The bight portion or wall 528 of each trackway 526 has a plurality of vertically spaced means 534 (Figures 19 through 21) for securing the trackways at selective vertical positions in the slots S, S of the conventional trackways T, T of the compartment C1. The securing means 534 are each defined by a downwardly opening hook struck and formed from the material of the bight portion or wall 528 of each of the trackways 526, 526. The hooks 534 are best illustrated in Figure 20 hooked into a pair of the vertically spaced slot S of the illustrated compartment trackway T. Obviously, the trackway 526 in Figure 20 can be raised to clear the hooks 534 relative to the slots S to effect detachment of the trackway 526 and subsequent readjustment thereof, should such be necessary or desirable. However, in keeping with the present invention, the intent thereof is for the end user to first select a precise location within the compartment C1 in which the trackways 526, 526 are located, thereupon secure the trackways 526, 526 thereat and thereafter effect adjustment of one or more of the shelves 515 in the compartment C1 by way of the latching slots or openings 550 and the pin means 560 (Figure 17) in the manner heretofore described and illustrated in Figure 6.

[0056] An end user might, for example, desire to utilize the bottom wall of the compartment C1 to support very tall items, such as gallon jugs of water, cartons of milk, upstanding wine bottles, etc. In such cases, relatively short length trackways 526, 526 can be utilized at upper portions of the compartment C1 in conjunction with perhaps two shelves 515 to support relatively flat or short products between the uppermost shelf 515 and the top wall of the compartment C1 and similar short products between the two shelves 515, 515. If somewhat longer trackways 526, 526 are utilized, three such shelves 515 can be utilized in conjunction therewith. By appropriately selecting the desired length of the trackways 526, 526, an end user can decide the number of shelves and the adjustment length desired to convert a conventional trackway system T, T of a conventional refrigerator R into the shelf assembly 510 of the present invention.

[0057] Each of the trackways 526, 526 includes a plurality of vertically spaced inwardly directed stops or protrusions 570 (Figures 19 through 21) corresponding to

the stop hooks 270 of the latter-identified pending application. The purpose and function of the stops or protrusions 570 corresponds identically to the functions described with respect to the stop hooks 270, and the totality of the description thereof is incorporated hereat by reference. However, the major purpose thereof is to prevent the shelf 515 from traveling vertically downwardly when unlatched accidentally or inadvertently and instead limit any such movement to incremental movement depending primarily upon the number of and vertical distance between the protrusions, stops, fingers or projections 270.

[0058] The trackways 526 also include terminal or bottommost means 570' which define lowermost means for similarly precluding inadvertent or accidental downward movement of the shelf 515 but additionally the shelf 515 from exiting the trackways 526, 526 through the bottoms thereof. Unless otherwise provided for, a shelf 515 might inadvertently or accidentally exit the bottom ends of the trackways 526, 526 should the pins 560 not latch with the slots 550 at a point below the last of the stops 570, though the last stop 570 can be provided immediate the bottommost end of each of the trackways 526. However, by providing the stop means 570' in the form of relatively large inwardly directed fingers, projections, flanges or tabs opposing each other (Figure 21), descen of the shelf 515 and its downward exit from the trackways 526 is assuredly precluded particularly because of the contact between the lubricity blocks 540 and the tabs, projections or noses 570'. However, even absent the lubricity blocks 540, the distance between the stop tabs or fingers 570' is such that the lower edge (unnumbered) of the shelf brackets 515, 517 cannot pass therebetween will abut the same, and will thereby be precluded from downwardly exiting the trackways 525, 525.

[0059] Although a preferred embodiment of the invention has been specifically illustrated and described herein, it is to be understood that minor variations may be made in the apparatus without departing from the spirit and scope of the invention, as defined by the appended claims.

Claims

1. A bracket for providing selective vertical adjustment comprising means for defining a vertical trackway, said vertical trackway including a plurality of vertically spaced latching means for selectively latching engagement with a travel member adapted to be selectively latched along said vertical trackway, and said trackway including means for stopping undesired downward vertical travel of the travel member after unlatching of the trackway latching means whereby inadvertent/accidental downward travel distance of the travel member is reduced.
2. The bracket as defined in claim 1 including at least

an additional means for stopping undesired downward vertical travel of the travel member after unlatching of the trackway latching means, and said first-mentioned and additional stopping means are disposed in vertically spaced relationship to each other.

3. The bracket as defined in claim 1 including at least an additional means for stopping undesired downward vertical travel of the travel member after unlatching of the trackway latching means, and said first-mentioned and additional stopping means are disposed in vertically aligned spaced relationship to each other.
4. The bracket as defined in claim 1 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member and said stopping means defines an obstruction surface along the vertical path of travel which is abutted by a portion of a travel member thereby stopping inadvertent/accidental downward movement thereof.
5. The bracket as defined in claim 1 wherein said vertical trackway includes at least two elongated walls defining a predetermined angle therebetween, a first of said walls includes said plurality of vertically spaced latching means, and a second of said walls includes said stopping means.
6. The bracket as defined in claim 1 wherein said vertical trackway includes at least two elongated legs, said plurality of vertically spaced latching means being defined by portions of said two elongated legs, and said stopping means being disposed between said legs.
7. The bracket as defined in claim 1 wherein said vertical trackway includes at least two elongated legs and an elongated bight portion therebetween, said plurality of vertically spaced latching means being defined by said two elongated legs, and said stopping means being disposed at said bight portion.
8. The bracket as defined in claim 1 wherein said vertical trackway includes at least two elongated legs and an elongated bight portion therebetween defining a substantially U-shaped transverse cross-sectional configuration, said plurality of vertically spaced latching means being defined by said two elongated legs, and said stopping means being disposed at said bight portion.
9. The bracket as defined in claim 1 including means for precluding disassembly of a travel member relative to the trackway by vertical downward movement of the travel member toward a lowermost end of said

trackway.

10. The bracket as defined in claim 1 including means for securing the trackway in a refrigerator compartment.
11. The bracket as defined in claim 1 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member, and said stopping means is a protrusion projecting into the unobstructed vertical path of travel.
12. The bracket as defined in claim 1 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member, and said stopping means is a dimple projecting into the unobstructed vertical path of travel.
13. The bracket as defined in claim 1 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member, and said stopping means is a tab projecting into the unobstructed vertical path of travel.
14. The bracket as defined in claim 2 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member, and said first-mentioned and additional stopping means is a protrusion projecting into the unobstructed vertical path of travel.
15. The bracket as defined in claim 2 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member, and said first-mentioned and additional stopping means is a dimple projecting into the unobstructed vertical path of travel.
16. The bracket as defined in claim 2 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member, and said first-mentioned and additional stopping means is a tab projecting into the unobstructed vertical path of travel.
17. The bracket as defined in claim 7 including at least an additional means for stopping undesired downward vertical travel of the travel member after unlatching of the trackway latching means, and said first-mentioned and additional stopping means are disposed in vertically spaced relationship to each other.
18. The bracket as defined in claim 7 including means for precluding disassembly of a travel member rela-

tive to the trackway by vertical downward movement of the travel member toward a lowermost end of said trackway.

- 5 19. The bracket as defined in claim 7 including means for securing the trackway in a refrigerator compartment.
- 10 20. The bracket as defined in claim 9 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member, and said disassembly precluding means define an obstruction at a lower end portion of the vertical path of travel beyond which a travel member cannot advance.
- 15 21. The bracket as defined in claim 9 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member, said disassembly precluding means define an obstruction at a lower end portion of the vertical path of travel beyond which a travel member cannot advance, and said obstruction is defined by a projection projecting into and blocking the path of travel to travel member advance.
- 20 22. The bracket as defined in claim 9 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member, said disassembly precluding means define an obstruction at a lower end portion of the vertical path of travel beyond which a travel member cannot advance, and said obstruction is defined by a pair of projections projecting into and blocking the path of travel to travel member advance.
- 25 23. The bracket as defined in claim 9 wherein said trackway defines a substantially unobstructed vertical path of travel for vertical downward movement therealong by a travel member, said disassembly precluding means define an obstruction at a lower end portion of the vertical path of travel beyond which a travel member cannot advance, and said obstruction is defined by a pair of opposing projections projecting into and blocking the path of travel to travel member advance.
- 30 24. The bracket as defined in claim 2 wherein said additional stopping means is located below said first-mentioned stopping means, and said additional stopping means further defines means for precluding downward disassembly of a travel member through a lower end portion of said trackway.
- 35 25. The bracket as defined in claim 24 wherein said additional stopping means includes at least one finger projecting into the unobstructed vertical path of travel.
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26. The bracket as defined in claim 24 wherein said additional stopping means includes at least a pair of fingers projecting into the unobstructed vertical path of travel.

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27. The bracket as defined in claim 24 wherein said additional stopping means includes at least a pair of opposing fingers projecting into the unobstructed vertical path of travel.

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28. The bracket as defined in claim 24 wherein said additional stopping means includes at least one finger formed from the material of said trackway projecting into the unobstructed vertical path of travel.

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29. The bracket as defined in claim 24 wherein said additional stopping means includes at least a pair of fingers formed from the material of said trackway projecting into the unobstructed vertical path of travel.

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FIG. 1

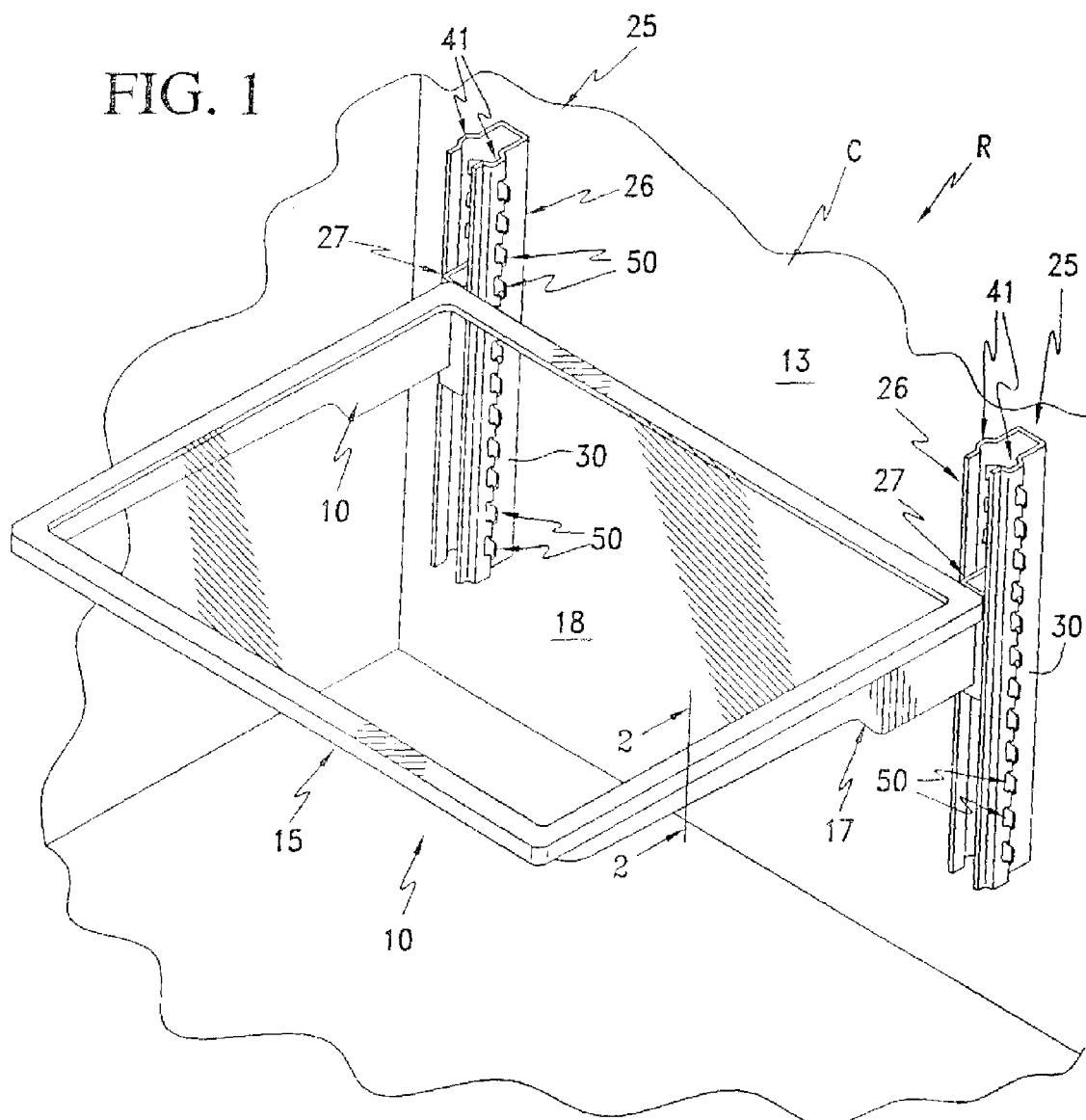
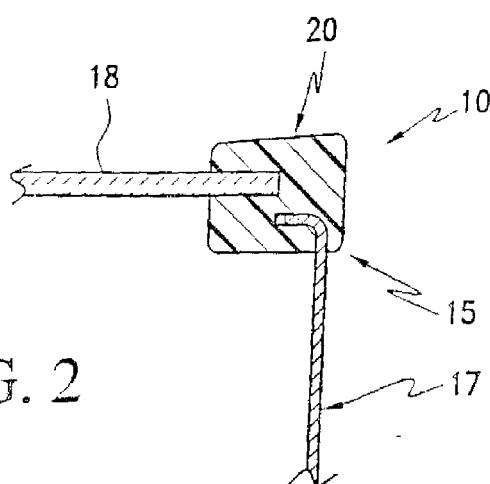


FIG. 2



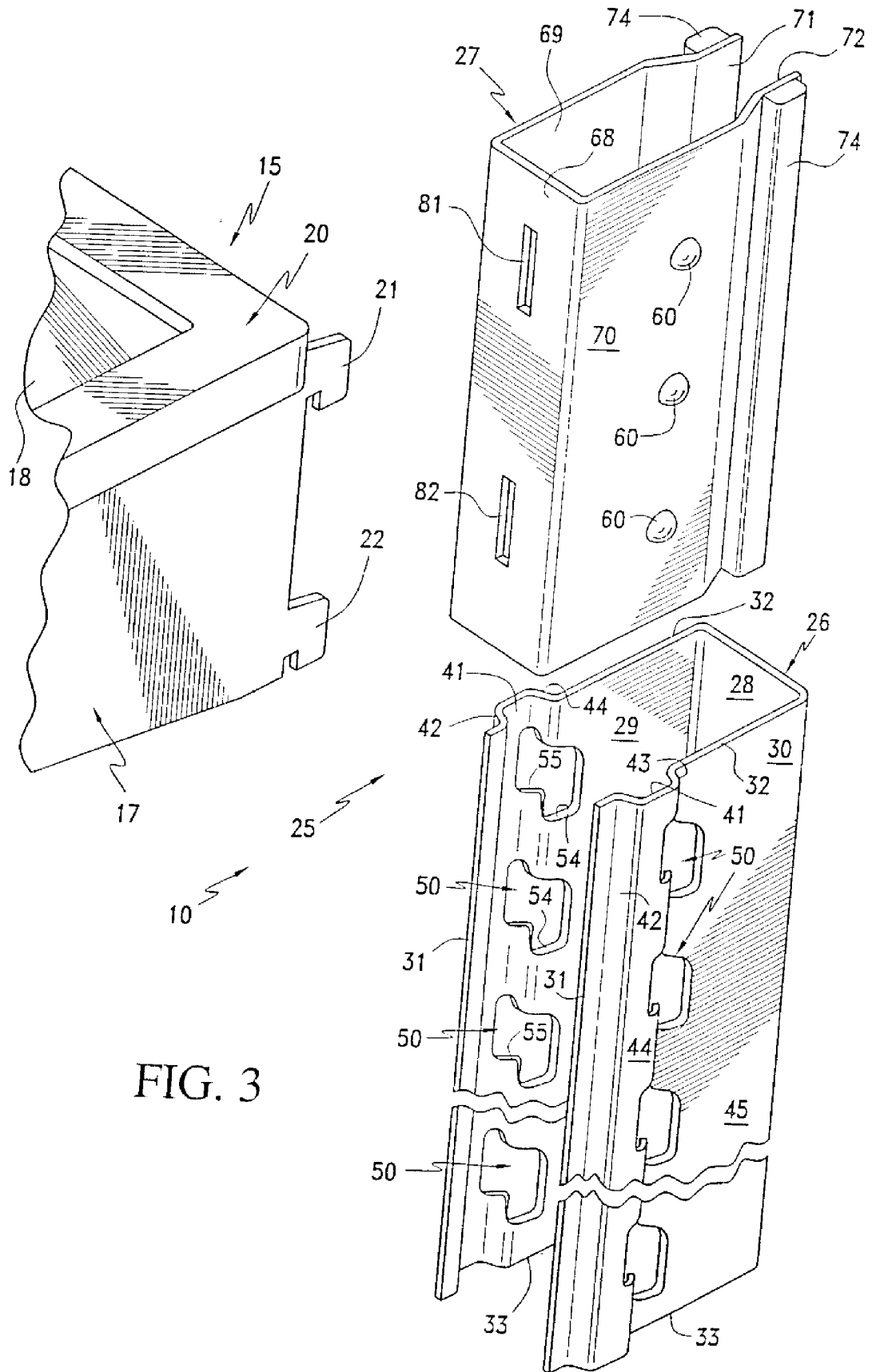


FIG. 4

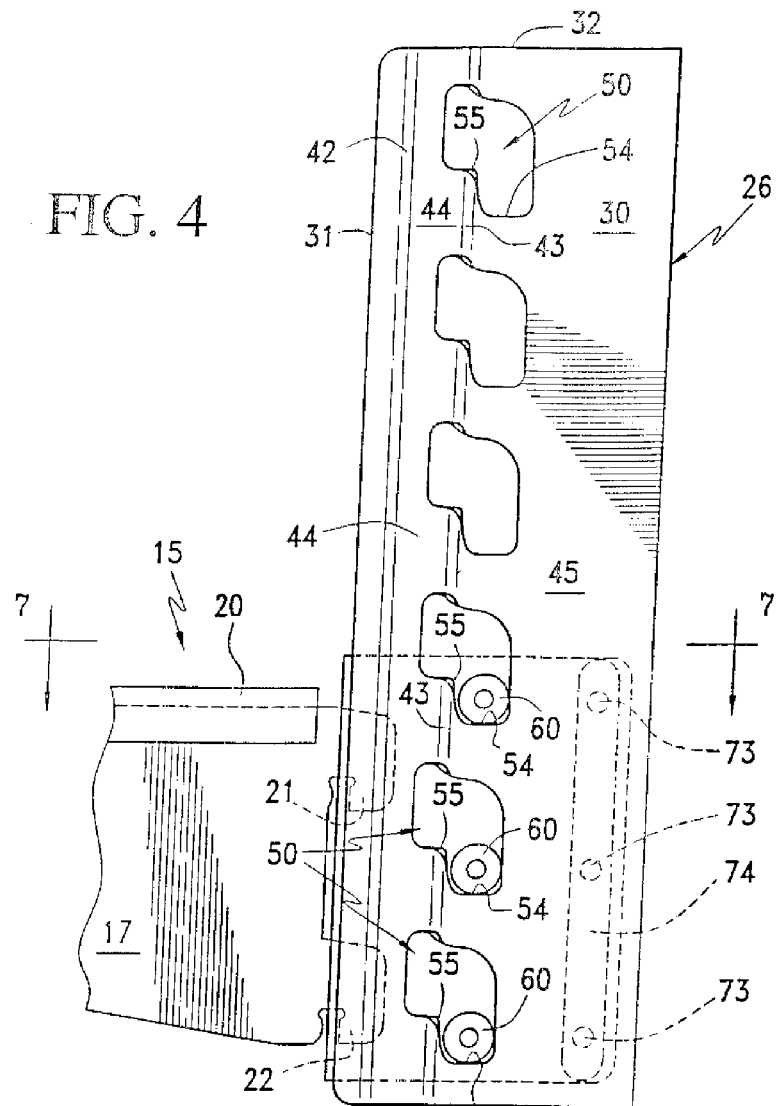


FIG. 5

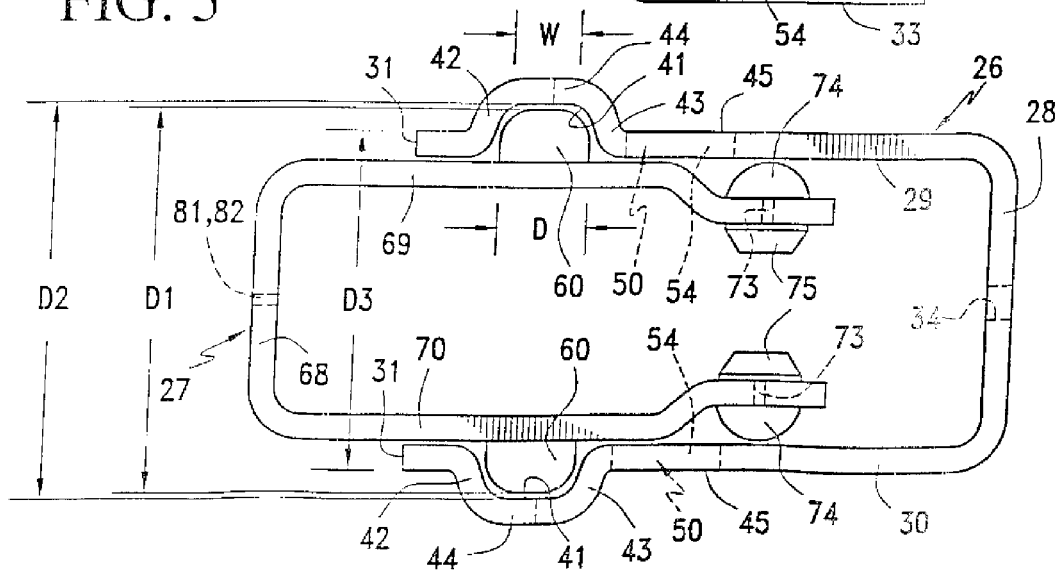


FIG. 6

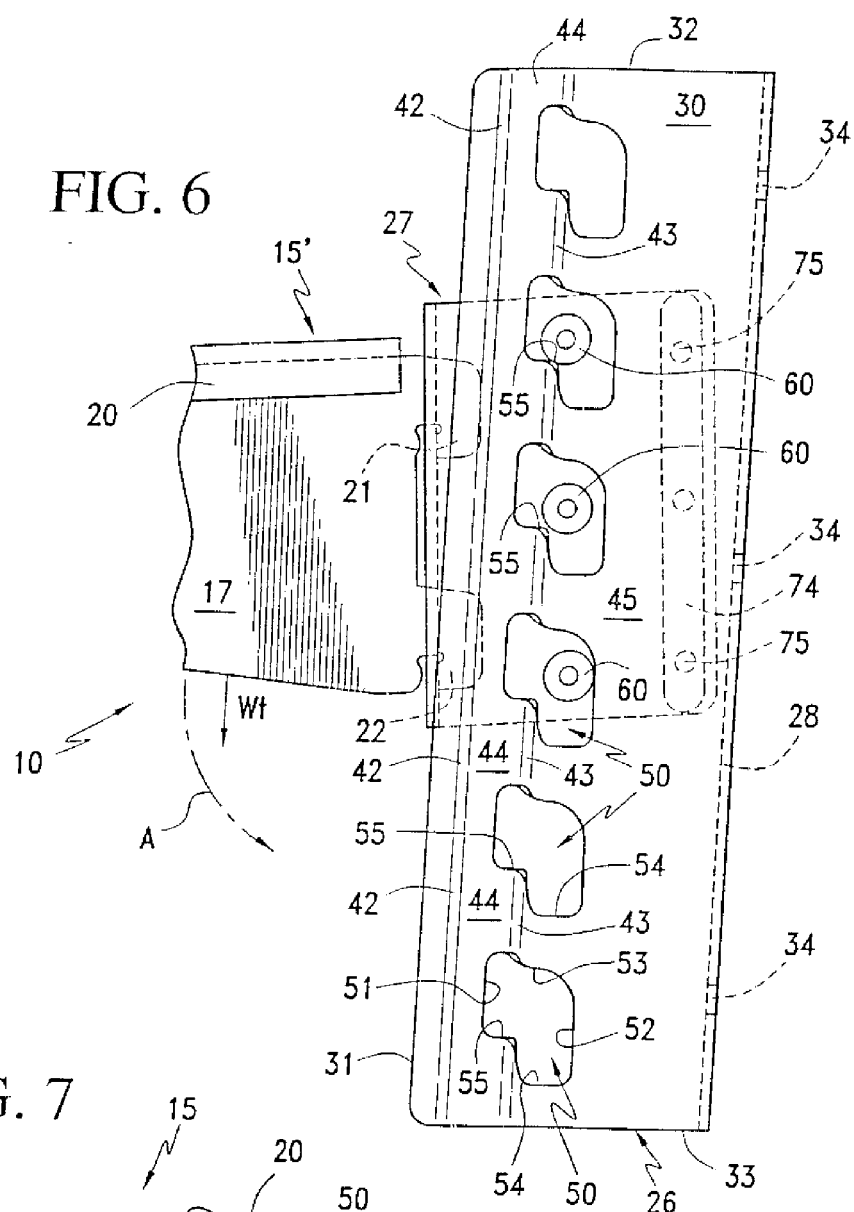


FIG. 7

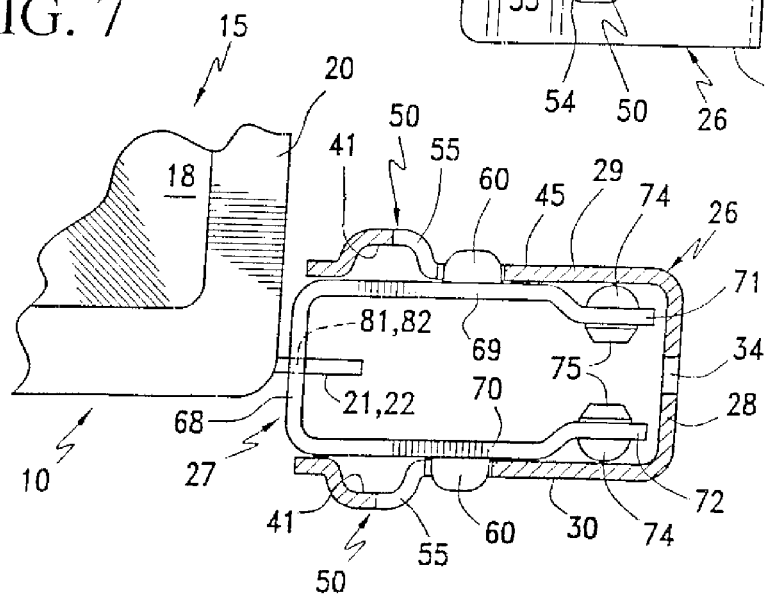


FIG. 9

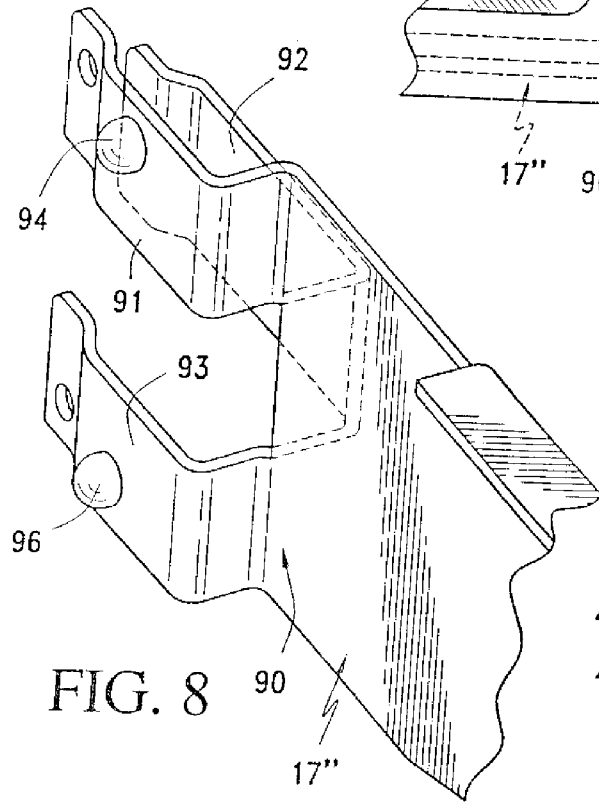
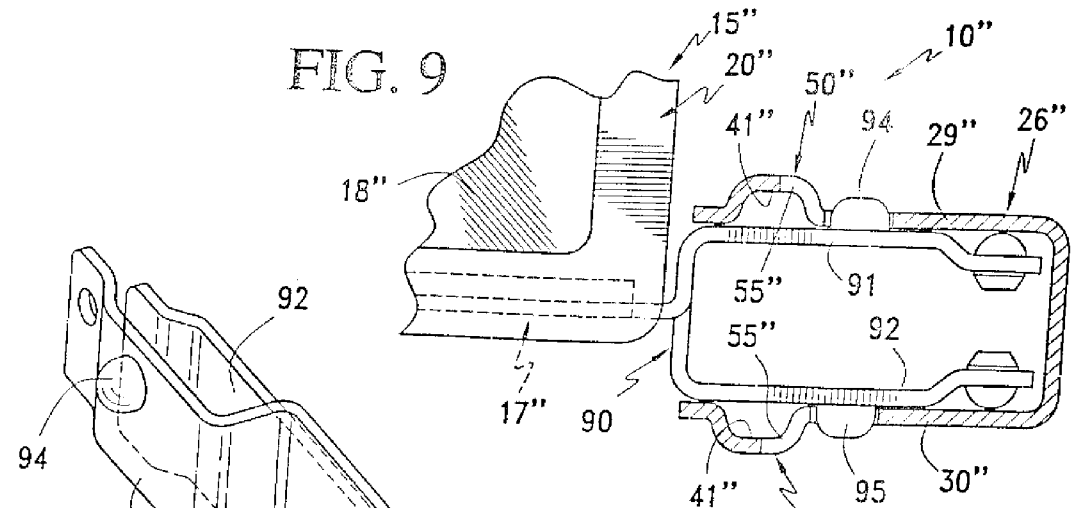


FIG. 8

FIG. 10

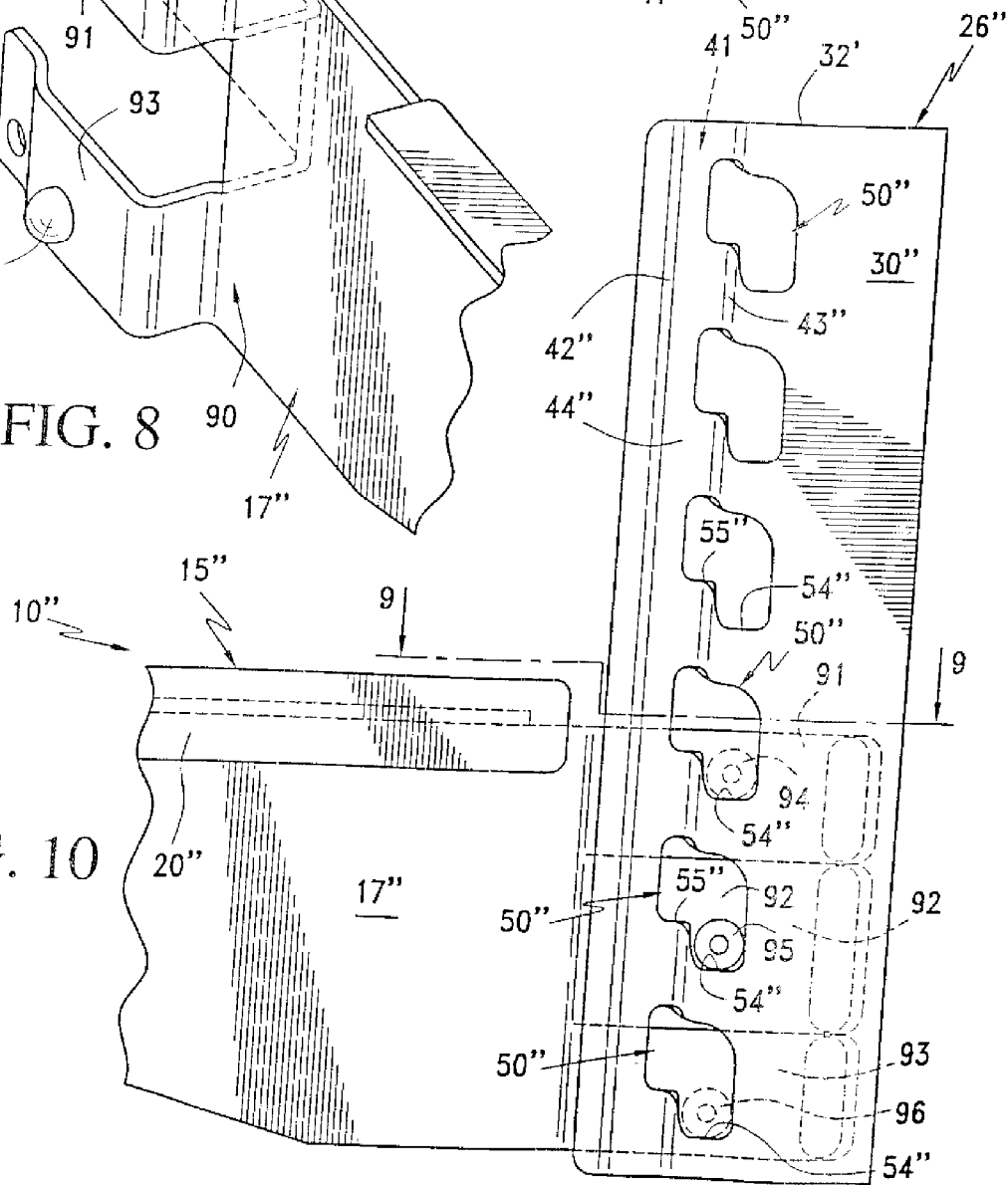


FIG. 11

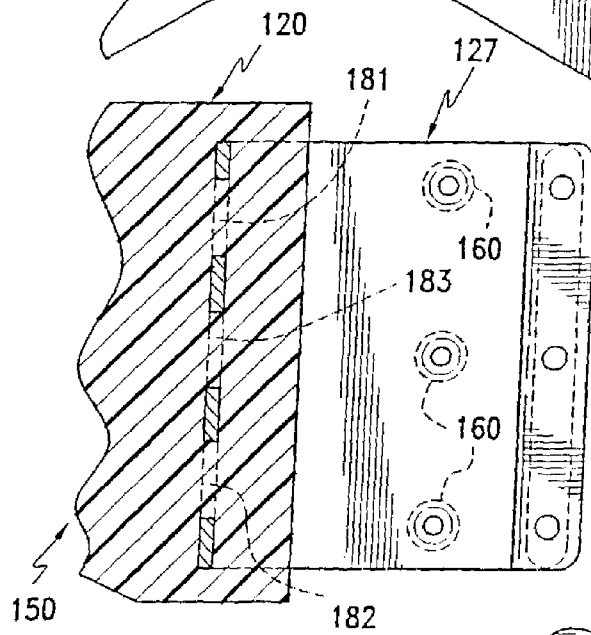
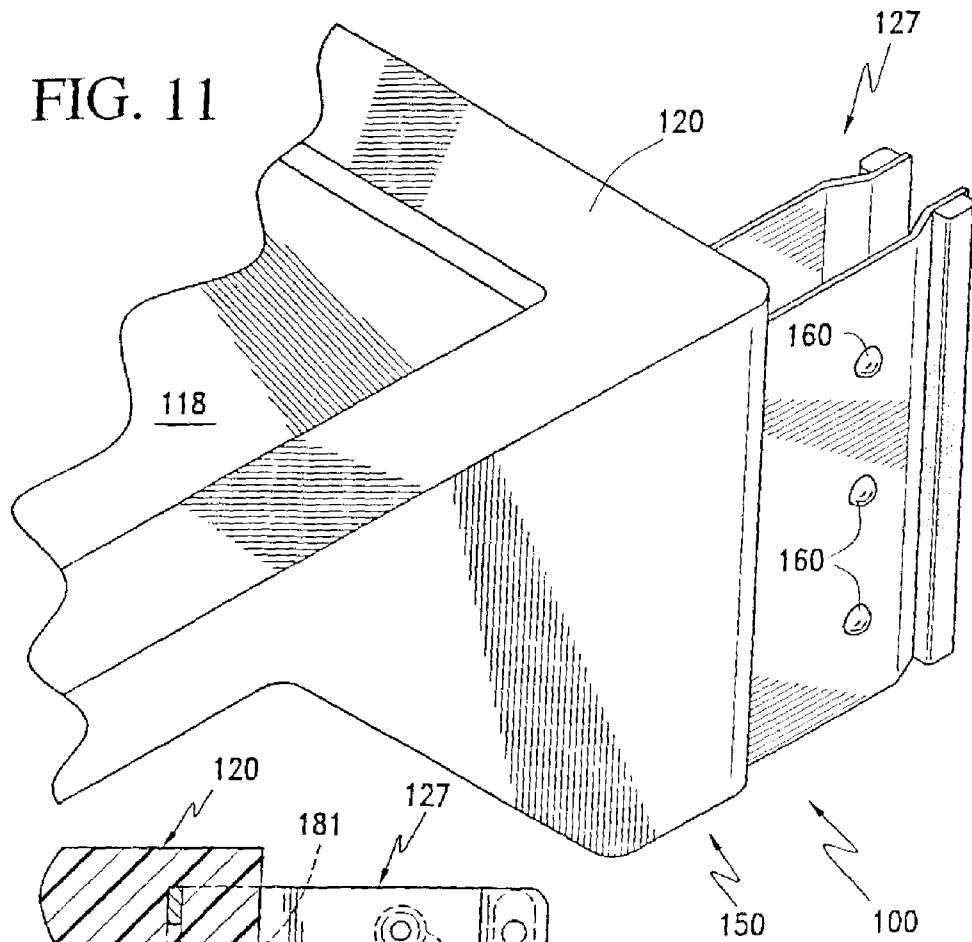
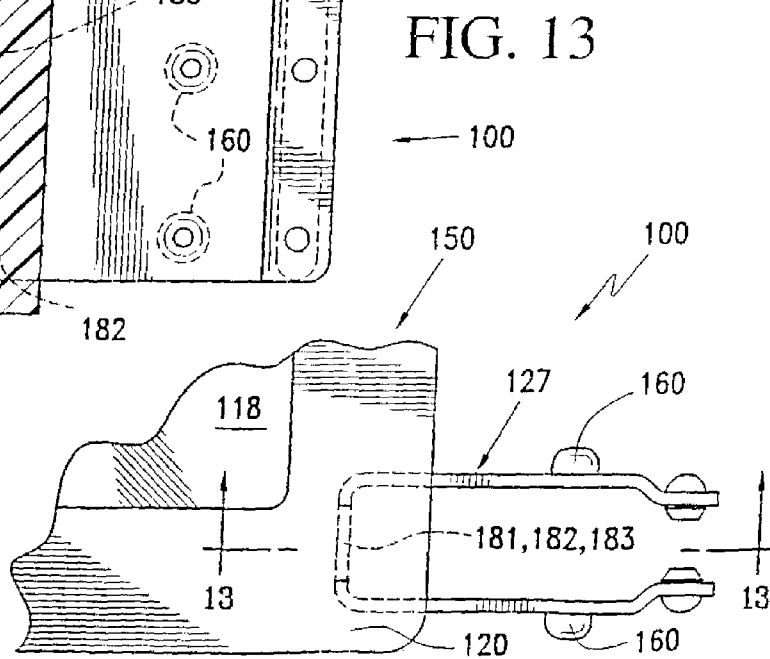
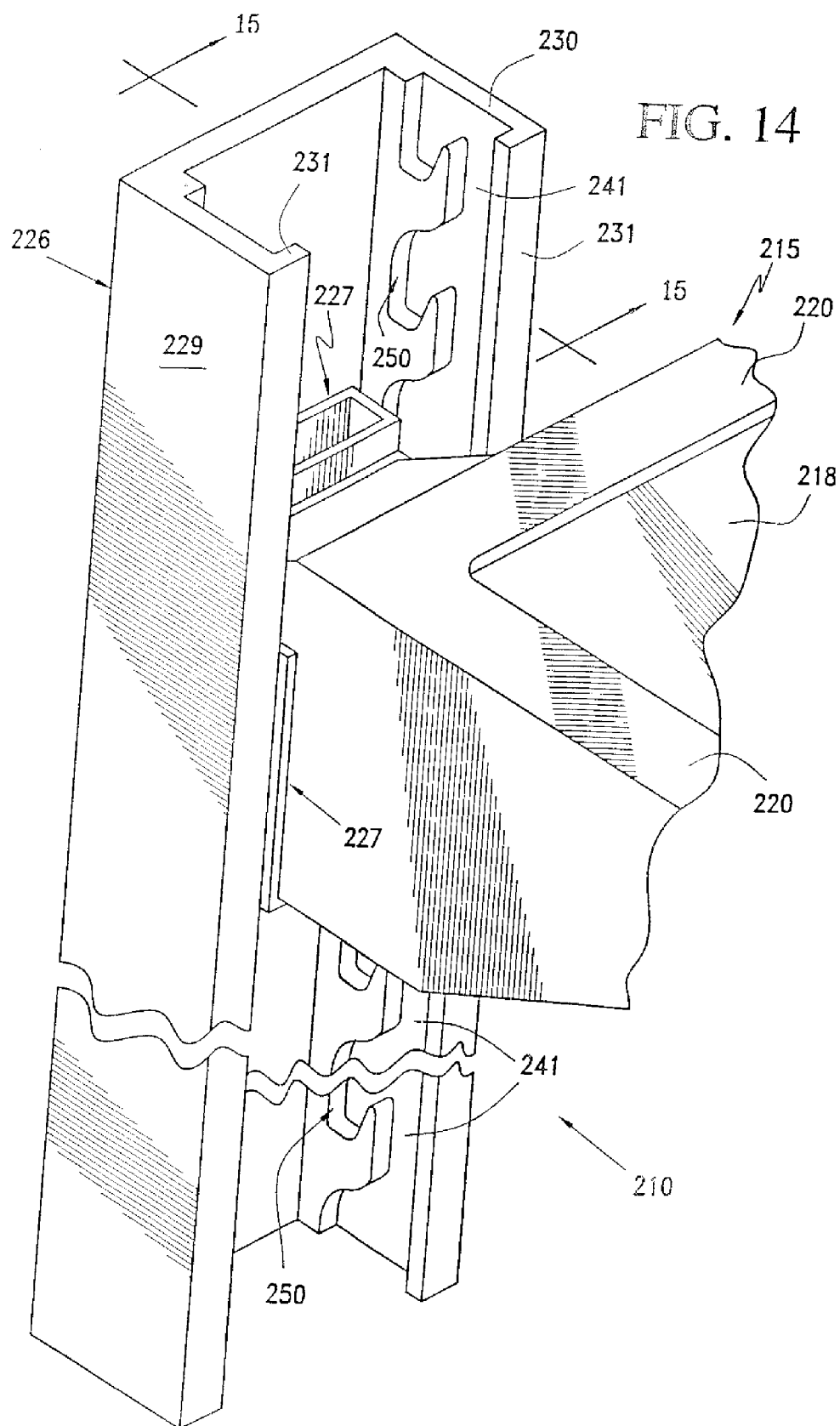


FIG. 13





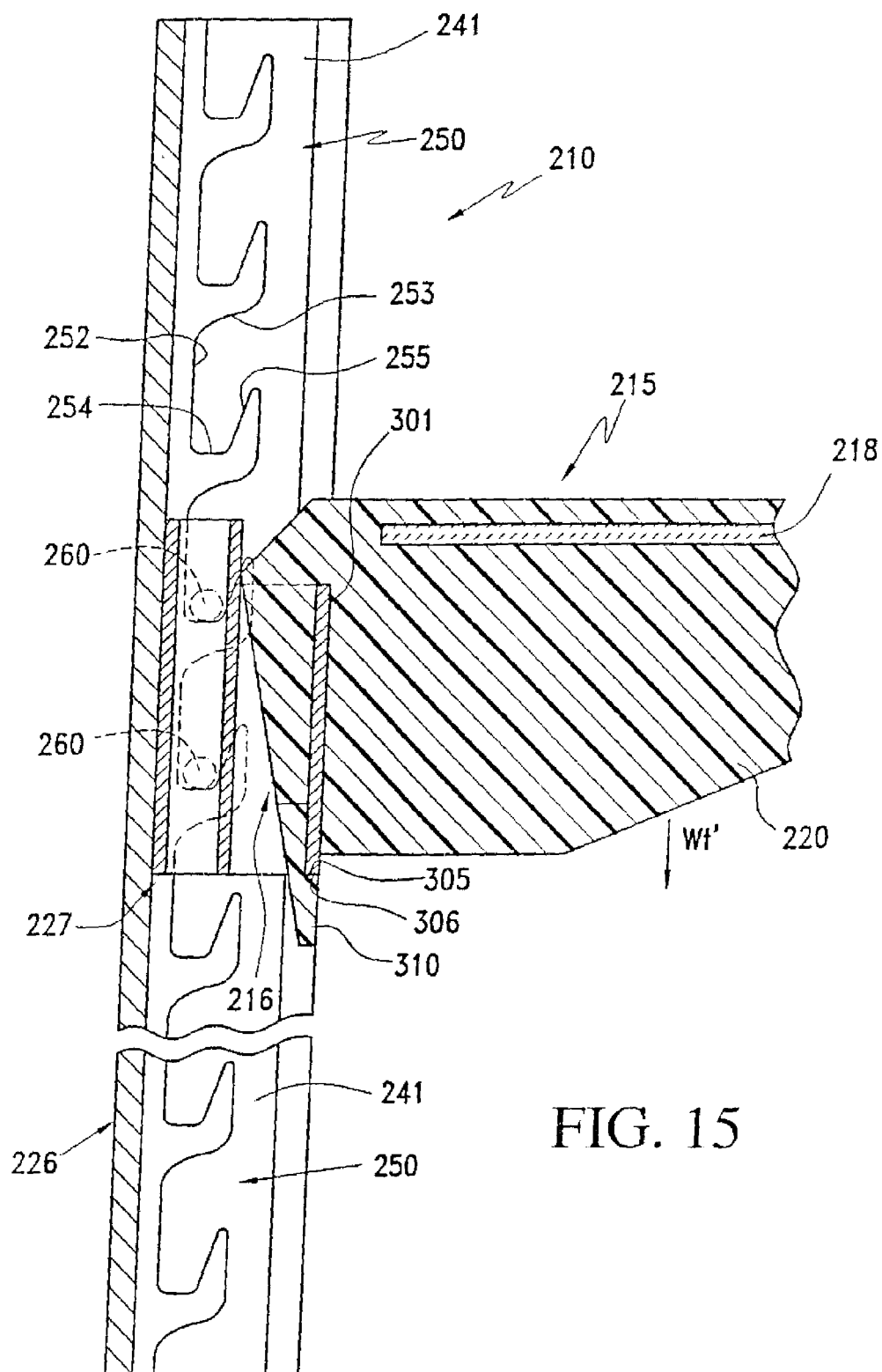
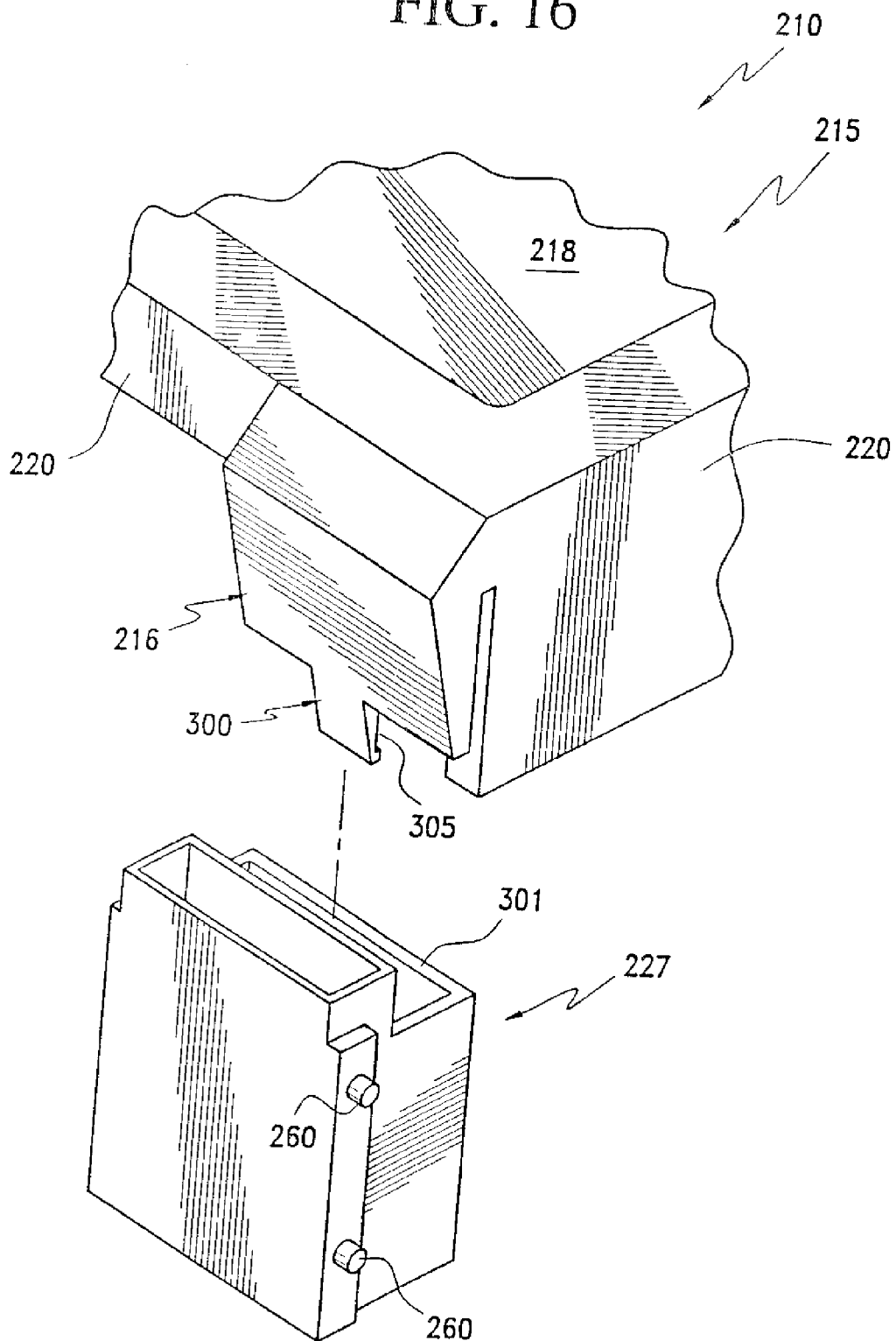


FIG. 15

FIG. 16



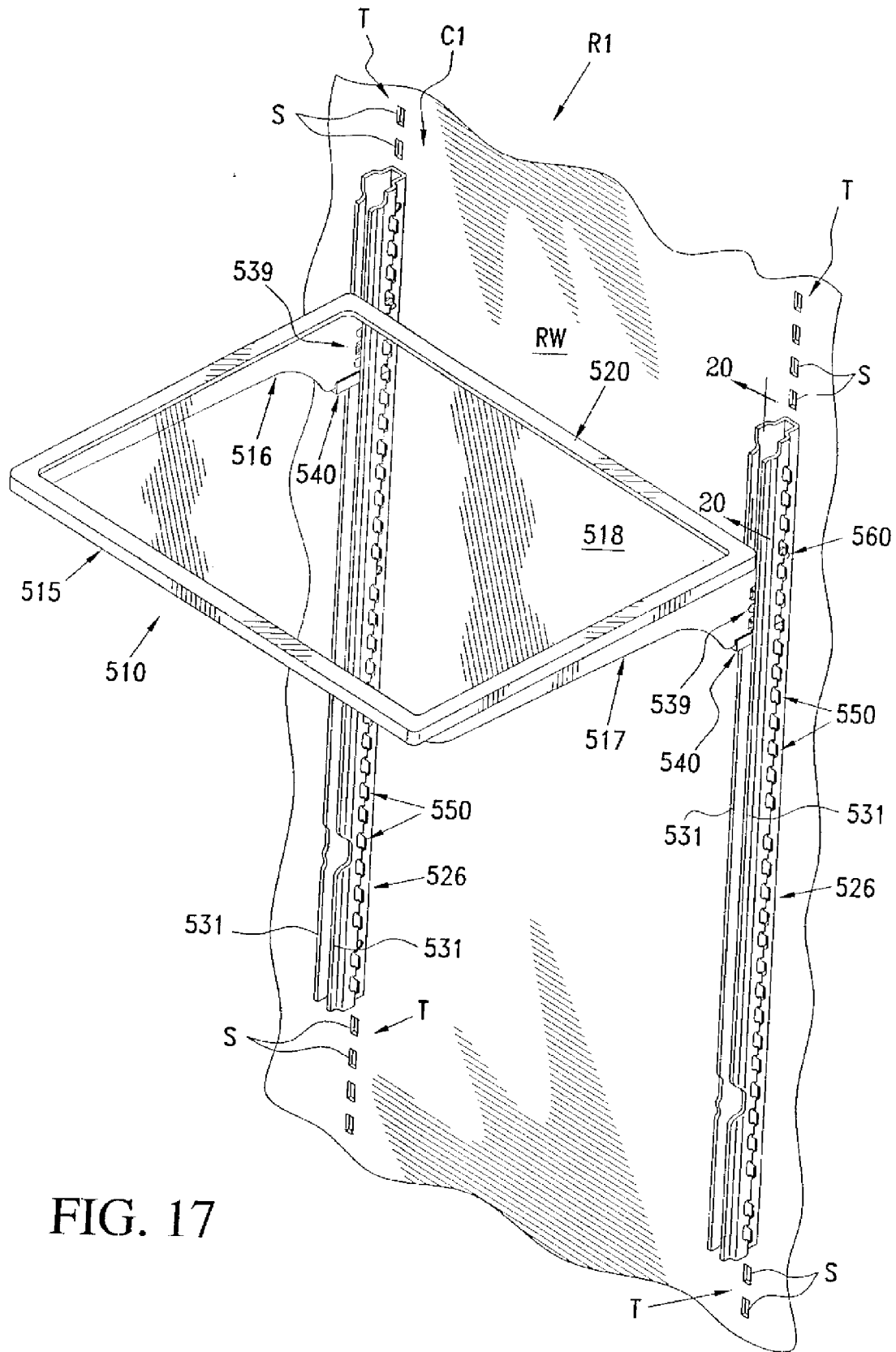


FIG. 17

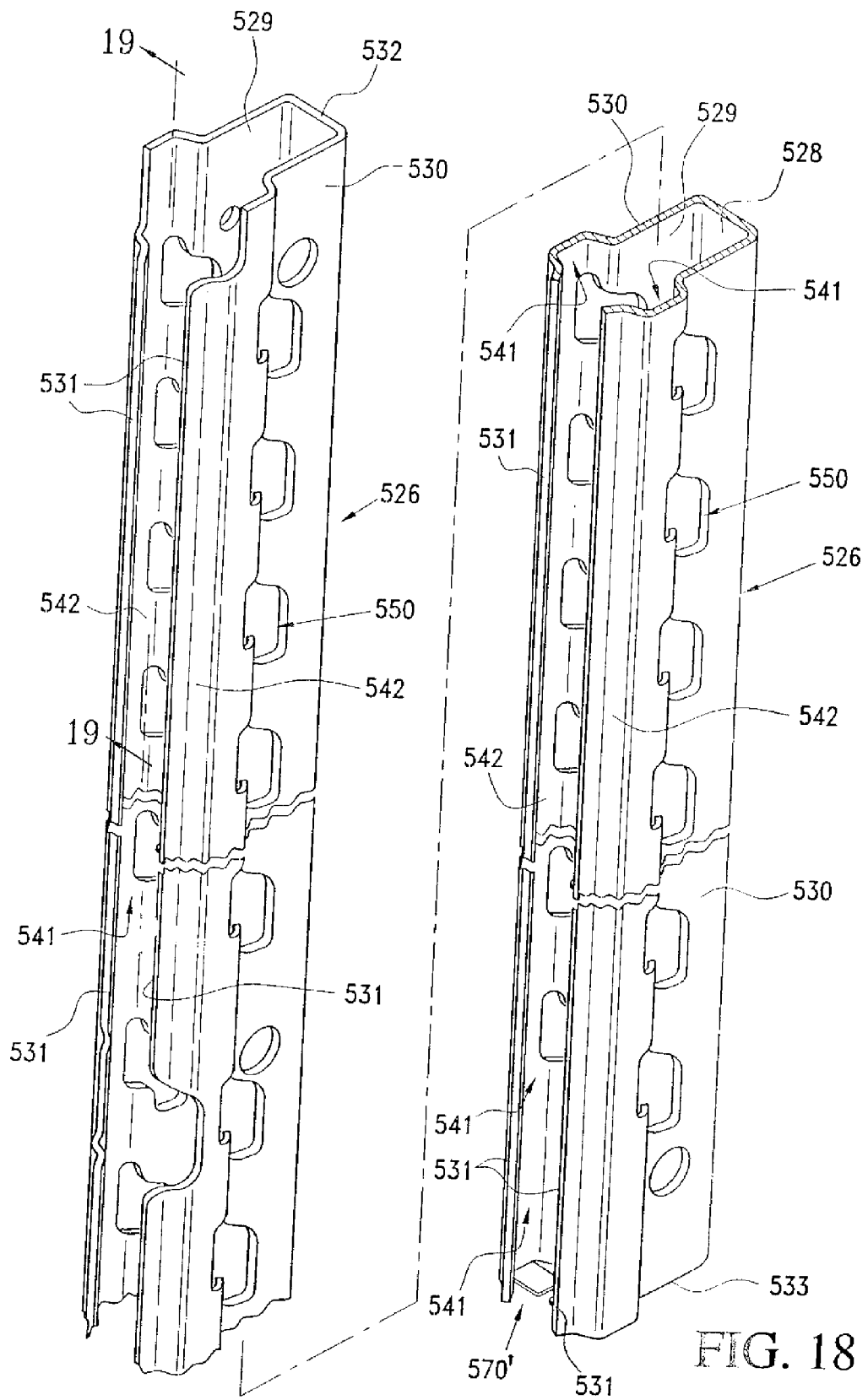


FIG. 18

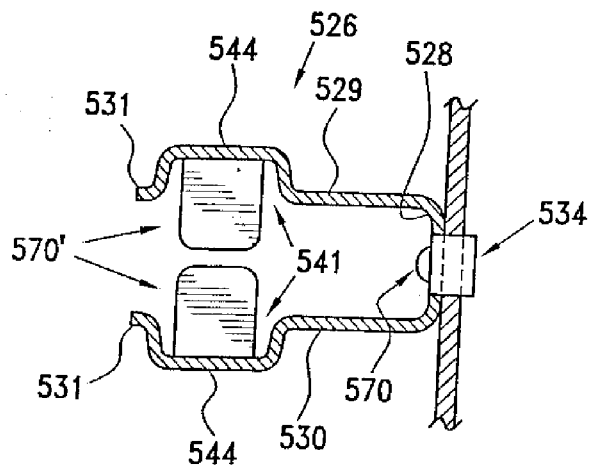


FIG. 21

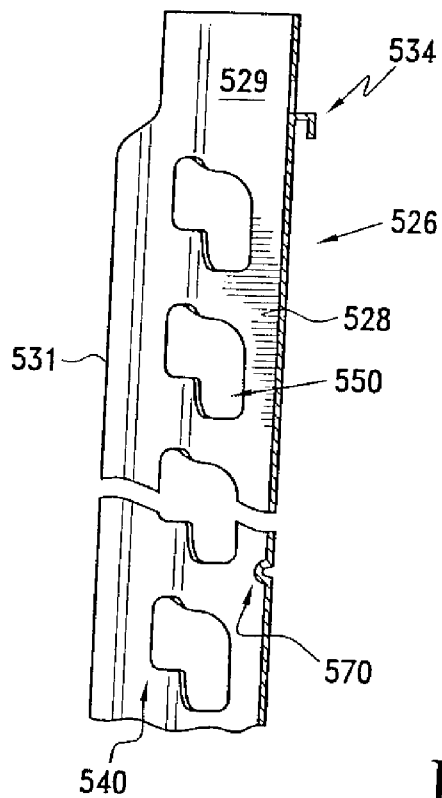


FIG. 19

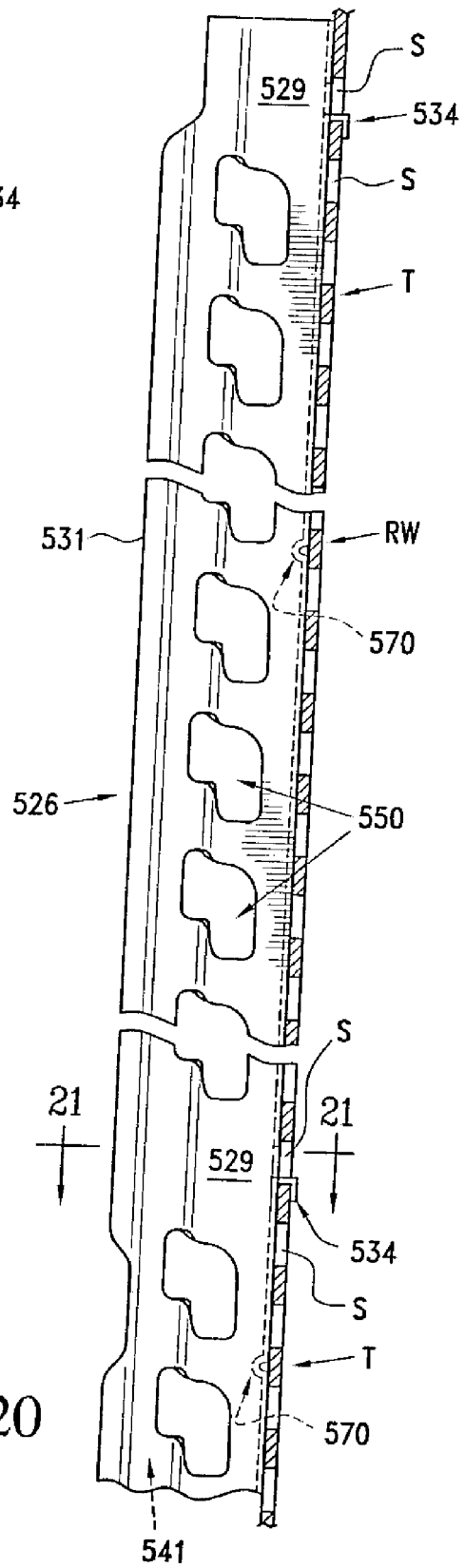


FIG. 20



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 05 10 6827

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 443 292 A (GEMTRON CORPORATION) 4 August 2004 (2004-08-04) * abstract * * paragraphs [0003] - [0005], [0032] * * figures 1,3,5,6,14-16 * -----	1-29	F25D25/02 A47B57/48
			TECHNICAL FIELDS SEARCHED (IPC)
			F25D A47B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 28 February 2006	Examiner Salaün, E
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EP 05 10 6827

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28-02-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1443292 A	04-08-2004	CA 2455723 A1	31-07-2004
		MX PA04000881 A	09-08-2004
		US 2005161421 A1	28-07-2005
		US 2005204966 A1	22-09-2005
		US 2005162055 A1	28-07-2005
		US 2005274299 A1	15-12-2005
		US 2004149182 A1	05-08-2004

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 10355136 B, Craig Bienick [0001]
- US 5362149 A, Bird [0035] [0050]