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(72) Inventor: **Bienick, Craig**
Jenison, MI 49428 (US)

(74) Representative: **Selting, Günther**
Von Kreisker Selting Werner
Deichmannhaus am Dom
Bahnhofsvorplatz 1
50667 Köln (DE)

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(71) Applicant: **Gemtron Corporation**
Sweetwater, Tennessee 37874 (US)

(54) **A method of manufacturing a vertically adjustable shelf bracket**

(57) A shelf bracket (17) is manufactured by providing a shelf bracket member having an opening (O) of a predetermined size. A pin (30) includes opposite end portions (31,32), a medial portion (35) and a single collar (36) which is of a size larger than the size of the opening

of the shelf bracket member. The medial portion of the pin is inserted into the shelf bracket member opening and a portion of the volume of the medial portion of the pin is swaged toward the one collar creating a second collar such that the shelf bracket and pin are clamped together by the two collars.

FIG. 1

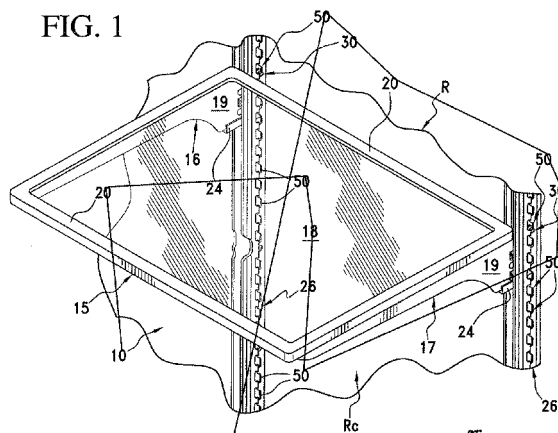
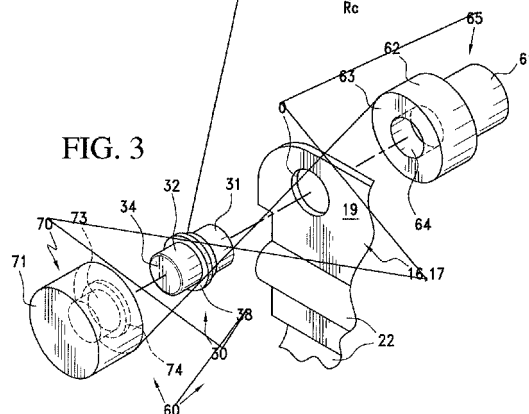


FIG. 3



Description

BACKGROUND OF THE INVENTION

[0001] This invention relates to adjustable shelving for refrigerators, but is equally adaptable for utilization in a variety of different environments, such as furniture shelves, cabinet shelves, point-of-sale displays and the like.

SUMMARY OF THE INVENTION

[0002] More specifically, the invention is directed to a novel method of manufacturing a shelf bracket which can be used singularly or in multiples to support a shelf in cantilever fashion relative to a vertical plane. When the shelf is utilized in conjunction with a refrigerator compartment, the refrigerator compartment preferably includes one or more vertical rails, tracks or trackways along which the shelf, and particularly the shelf brackets thereof, can be selectively vertically adjusted to accommodate the heights of such shelves to achieve desired spacing therebetween and/or accommodate articles of different heights supported thereon. Shelf brackets of such cantilever shelves are conventionally provided with one or more hooks which engage in one or more slots of trackways to effect vertical adjustment. However, in lieu of such single or multiple hooks per shelf bracket, the present invention provides a novel shelf bracket which includes a pin having axially opposite end portions which can be selectively moved along a trackway and selectively latched in opposite locking slots of the trackway to position the shelf in any one of a plurality of selected adjusted positions of cantilevered support.

[0003] In keeping with the method of manufacturing a cantilevered shelf bracket in accordance with the present invention, a shelf bracket member is provided having front and rear end portions with an opening of a predetermined size in the rear end portion. A pin is provided having opposite end portions and a medial portion of a size corresponding to the predetermined size of the shelf bracket member opening which defines an annular shoulder with one of the axial end portions of the pin. The medial portion also includes a collar of a size larger than the size of the shelf bracket member opening. The pin and opening are assembled such that the medial portion is located in the shelf bracket member opening and the collar contacts the shelf bracket member. Thereafter, the medial portion is waged in a direction toward the collar by applying a force against the annular shoulder in a direction toward the collar. The latter forms a swaged collar from the material of the medial portion of a size larger than the shelf bracket member opening thereby securing the pin to the shelf bracket member by sandwiching the rear end portion of the shelf bracket member between the two collars.

[0004] In further accordance with the method of the present invention, the pin is preferably constructed from

metal and is of a one piece construction prior to and after the performance of the swaging operation. Additionally, the pin axially opposite end portions, medial portion and first-mentioned collar are each preferably substantially cylindrical and the shelf bracket member opening is circular. However, the pin and shelf bracket member opening can be of a polygonal, oval, or like configuration.

[0005] In further accordance with the present invention, the shelf bracket elongated member is preferably constructed from metal and the rear end portion includes a plurality of ribs which reinforce the shelf bracket and establish a predetermined distance between the peaks of the ribs corresponding to a transverse dimension of an associated trackway to reduce wobble of an associated shelf when supported by or moved along one or more associated trackways.

[0006] In further accordance with the present invention, the ribs are preferably formed by a braking or folding operation with there being at least two ribs with one rib projecting from each of an opposite side of the shelf bracket elongated member.

[0007] In further accordance with the present invention, the shelf bracket elongated member preferably carries a separately attached lubricity block for reducing friction to ease adjusting movement of the shelf bracket relative to an associated trackway.

[0008] One or more of the shelf brackets or shelf bracket members of the present invention can be utilized to manufacture a shelf or shelf assembly by known fabrication methods. One such method includes unitizing a tempered piece of glass to a pair of the shelf bracket members by an injection molded encapsulation or frame, as is disclosed in U.S. Patent No. 5,428,433 granted on July 4, 1995 to Kevin C. Bird et al.; U.S. Patent No. 5,540,493 granted on July 30, 1996 to Edmond J. Kane et al.; and U.S. Patent No. 5,705,113 granted on January 6, 1998 to Edmond J. Kane et al., the subject matters of which are incorporated herein by reference.

[0009] Instead of an injection molded/encapsulated frame, the shelf bracket of the present invention can be utilized to manufacture a refrigerator shelf of the type disclosed in U.S. Patent No. 4,934,541 granted on June 19, 1990 to Marc R. Bussan et al. in which two frame members are adhesively bonded to each other and between which is captured a peripheral edge of a piece of tempered glass. The shelf bracket of the present invention can also be utilized as part of an entirely metal shelf utilizing a wire support rather than a piece of tempered glass, as is disclosed in U.S. Patent No. 5,004,302 issued on April 2, 1991 in the name of George E. Stocking et al. Alternatively, two of the shelf brackets of the present invention can be connected to each other in the manner disclosed in the shelf of U.S. Patent No. 4,923,260 issued on May 8, 1990 to Douglas Poulsen. As a final example, a single shelf bracket of the present invention can be used to manufacture a cantilevered shelf as disclosed in Figures 24 and 25 of co-pending application Serial No. 11/088,837 filed on March 25, 2005 in the name of Craig

Bienick et al. and entitled "Vertically Adjustable Shelves and Refrigerator Compartment Housing the Same." The totality of the disclosure of the latter-identified application is incorporated hereat by reference. However, no matter the specifics of the particular shelf that might be manufactured utilizing the shelf bracket of the present invention, the significance from a method standpoint involves the novel and unobvious method of manufacturing the shelf bracket specifically by swaging a portion of a pin housed within an opening of the shelf bracket or shelf bracket member to retain the shelf bracket member assembled to the pin through a pair of collars at least one of which is formed from swaged material of the pin.

[0010] 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

[0011]

FIGURE 1 is a fragmentary perspective view of the interior of a refrigerator compartment, and illustrates a shelf or shelf assembly formed by a piece of tempered glass encapsulated by an injection molded frame to a pair of shelf brackets which can be step-adjusted relative to slots in a pair of trackways of the refrigerator compartment.

FIGURE 2 is a fragmentary exploded perspective view of one of the shelf brackets and the associated trackway of Figure 1, and illustrates details of the trackway including a vertical slideway and a plurality of pairs of vertically spaced slots into which can be received a latching or supporting pin carried by a rear or rear end portion of the shelf bracket.

FIGURE 3, which appears on the sheet of drawing containing FIGURE 1, is a fragmentary perspective view of a rear portion of a shelf bracket, and illustrates an opening therein, a pin prior to insertion in the opening, and swaging tools in the form of a punch and die for swaging a collar from the material of the pin to secure the pin to the shelf bracket.

FIGURE 4 is a fragmentary axial cross-sectional view taken through the rear end portion of the shelf bracket, and illustrates an opening in the rear end portion and the pin which initially includes axially opposite end portions of substantially the same diameter, a larger medial portion defining an annular shoulder or wall, and a larger collar prior to being seated against the shelf bracket rear end portion.

FIGURE 5 is a fragmentary cross-sectional view similar to Figure 4, and illustrates the shelf bracket and pin of Figure 4 in assembled relationship prior to being interlocked to each other by a swaging operation with the larger collar seated against the shelf bracket rear end portion.

FIGURE 6 is an axial cross-sectional view, and illustrates the position of the shelf bracket, pin, male punch and female die prior to swaging the material of the medial portion of the pin toward the collar by applying a force to the annular shoulder of the medial portion.

FIGURE 7 is a fragmentary cross-sectional view of the shelf bracket similar to Figure 5, and illustrates the shelf bracket substantially rigidly connected to the pin in sandwiched relationship between the two collars.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] A novel refrigerator shelf or shelf assembly constructed in accordance with the present invention is illustrated in Figures 1 and 2 of the drawings and is generally designated by the reference numeral 10.

[0013] The shelf or shelf assembly 10 includes a shelf 15 defined by substantially identical opposite parallel metal shelf brackets or shelf bracket members 16, 17 unitized to a peripheral edge (unnumbered) of a tempered glass shelf member or panel 18 by an injection molded encapsulation, rim or border 20 formed in accordance with the method disclosed in the earlier-mentioned U.S. Patent No. 5,362,149. Each support bracket 16, 17 of the shelf assembly 10 includes a front end portion (unnumbered) and a rearmost end portion 19, the latter of which includes pin means 30 for effecting vertical step-wise adjustment with respect to vertically spaced support means, slots or openings 50 of vertical trackways 26, 26 (Figure 1) of a refrigerator compartment Rc of a refrigerator R. Each shelf bracket or shelf bracket member 16, 17 includes a plurality of braked and bent stabilizing means or parallel ribs 22 (Figure 2) and a separately attached lubricity block 24 more specifically described in the latter-identified pending application. Suffice it to state that when the lubricity block 24 is secured to the shelf brackets 16, 17 and the trackways 26 are secured in the refrigerator compartment Rc by conventional screws S (Figure 2), the shelf 15 can be inserted into and vertically adjusted with respect to the trackways 26 and locked in any desired position of desired adjustment by latching engagement between the pins 30 and the slots 50.

[0014] Reference is specifically made to Figure 3 of the drawings which illustrates the rearmost end portion 19 of the shelf bracket or elongated member 16, 17, and a substantially circular opening O therein having a diameter D (Figure 4). The pin 30 (Figures 3 through 6) is made of a single piece of substantially homogeneous metal material and is defined by substantially axially opposite cylindrical end portions 31, 32 terminating at substantially circular end faces or end surfaces 33, 34, respectively. The axial end portions 31, 32 each have a diameter d which is slightly less than the diameter D of the opening O of the shelf brackets 16, 17. A substantially cylindrical medial portion 35 of the pin 30 is of a diameter Dm (Figure 5) which is substantially identical to the di-

iameter D of the opening O of the shelf brackets 16, 17, and since greater than the diameter d of the axial end portion 31, defines therewith an annular wall or shoulder 36. The radial width of the annular shoulder 36 is the difference between the diameters d and Dm (Figures 4 and 5). A substantially cylindrical collar 38 is remote from the annular wall 36 and a diameter Dc (Figures 4 and 5) thereof is substantially greater than the diameter D of the opening O of the shelf brackets 16, 17.

[0015] Having thus described the pin 30 prior to assembly to the shelf brackets 16, 17, tooling for performing the assembly method is generally designated by the reference numeral 60 (Figures 3 and 6) which includes a male punch 65 and a female die 70.

[0016] The male punch 60 includes a cylindrical force-applying end portion 61 and an enlarged collar 62 having an annular end face 63 inboard of which is a cylindrical bore 64. A diameter Db (Figure 6) of the cylindrical bore 64 substantially corresponds to the diameter d of the axial end portion 31 of the pin 30.

[0017] The female die 70 includes a force-applying end face 71, an opposite shelf bracket supporting end face 72 (Figure 6) and between the faces 71, 72 a cylindrical bore 73 and a larger cylindrical counterbore 74. The bore 73 has a diameter Db' (Figure 6) corresponding substantially to the diameter d of the axial end portion 32 of the pin 30, whereas the counterbore 74 has a diameter Dc' (Figure 6) corresponding substantially to the diameter Dc of the collar 38.

[0018] The first step in the assembly method is performed by relatively moving the shelf bracket or shelf member 16, 17 relative to the pin 30 such that the opening O of the shelf bracket 16, 17 embraces the medial portion 35 of the pin 30 and seats upon the collar 38, as shown in Figure 5 of the drawings. The latter assembly is then positioned with the pin end portion 32 and the collar 38 received respectively in the cylindrical bore 73 and the larger counterbore 74 of the female die 70 and with the rearmost end portion 19 of the shelf bracket 16, 17 seated upon the shelf bracket supported end face 72, as is illustrated in Figure 6 of the drawings. It is to be understood that in lieu of the pre-assembly illustrated in Figure 5, the pin 30 can be first inserted into the bores 73, 74 of the female die 70 and the shelf bracket 16, 17 assembled thereto. In either event, thereafter the male punch 65 is positioned as shown in Figure 6 with the annular end face 63 immediately adjacent the bore 64 resting upon the annular collar 36 of the pin 30. A conventional punch and die press (not shown) can be used to impart an axial force F (Figure 6) preferably to the male punch 65, or to the female die 70, or both, to relatively move the male punch 65 and female die 70 toward each other at which time an annular volume of material of the cylindrical medial portion 35 of the pin 30 (unnumbered) between the annular wall 36 and the collar 38 is progressively swaged toward (downwardly in Figure 6), and ultimately intimately against the rear end portion 19 of the shelf bracket 16, 17 forming a swaged collar 39 (Figure 7) which under

the high force F of the swaging operation rigidly clampingly connects the shelf bracket 16, 17 between the collars 38, 39 of the pin 30. The volume of material swaged is such that (a) the diameter Ds (Figure 7) of the swaged collar 39 corresponds substantially to the diameter Dc of the collar 38, and (b) the axial lengths A1, A2 (Figure 7) between the collars 39, 38 and the respective pin end faces 33, 34 are substantially equal as are the diameters d of the pin end portions 31, 32. The shelf brackets 16, 17 are thereby substantially identical and interchangeable as right-hand or lefthand brackets of the shelf 15 and the pins 30 thereof are equally functionally operative with the slots 50 of either of the trackways 26.

[0019] In further accordance with this invention, a pin can be provided which excludes one of the end portions or, stated otherwise, at one of the end portions the pin includes a collar, followed by a medial portion, the annular wall of the latter, and an end portion. The pin is assembled into an opening of a shelf bracket such that the shelf bracket rests upon the one collar after which the medial portion is swaged to create a second collar with the shelf bracket being clamped therebetween. The end result is a shelf bracket having a pin with an axial end portion projecting only from one side thereof. A shelf manufactured with such a shelf bracket would move in one or more trackways with the pin engaging in a single slot of each trackway, as opposed to a pair of pins engaging opposite slots of the same trackway.

[0020] 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 shelf bracket comprising an elongated member having rearward and forward end portions, an opening of a predetermined size in said rearward end portion, a pin, said pin having axially opposite ends, said pin having a pin portion between said axially opposite ends, said pin portion being located in said opening, said pin portion including a pair of axially spaced collars each of a size larger than said opening, and said elongated member rearward end portion being sandwiched between said collars whereby at least one axial end portion of said pin projecting away from an adjacent one of said collars can engage an associated support.
2. The shelf bracket as defined in claim 1 wherein at least one of said collars is formed from the material of said pin.
3. The shelf bracket as defined in claim 1 wherein said collars are both formed from the material of said pin.

4. The shelf bracket as defined in claim 1 wherein said pin and at least one of said collars are constructed from a single piece of substantially homogeneous material.
5. The shelf bracket as defined in claim 1 wherein said pin and pair of collars are constructed from a single piece of substantially homogeneous material.
6. The shelf bracket as defined in claim 1 wherein at least one of said collars is formed from the material of said pin swaged from a size corresponding to said opening predetermined size to said larger collar size.
7. The shelf bracket as defined in claim 1 wherein at least one of said collars is swaged from a portion of the material of said pin portion.
8. The shelf bracket as defined in claim 2 wherein said pin and pair of collars are constructed from a single piece of substantially homogeneous material, and one of said pair of collars is swaged from the material of said pin portion.
9. The shelf bracket as defined in claim 6 wherein said collars are both formed from the material of said pin.
10. The shelf bracket as defined in claim 6 wherein said pin and pair of collars are constructed from a single piece of substantially homogeneous material.
11. The shelf bracket as defined in claim 7 wherein said collars are both formed from the material of said pin.
12. The shelf bracket as defined in claim 7 wherein said pin and pair of collars are constructed from a single piece of substantially homogeneous material.
13. A method of manufacturing a shelf bracket comprising the steps of -
 - (a) providing a shelf bracket member having an opening of a predetermined size,
 - (b) providing a pin defined by opposite end portions and a medial portion therebetween of a size corresponding substantially to the opening size and a collar of a size larger than the opening size spaced from an annular shoulder,
 - (c) relatively moving the opening and pin such that the medial portion enters the opening, and
 - (d) swaging the medial portion toward the collar by applying a force against the annular shoulder in a direction toward the collar to thereby form a swaged collar of a size larger than the opening size whereby the pin is secured to the shelf bracket member by the collars.
14. The method as defined in claim 13 including the step of constructing the pin end portions of substantially the same size.
15. The method as defined in claim 13 including the step of constructing the pin end portions of substantially the same size and the medial portion of a larger size than the last-mentioned size.
16. The method as defined in claim 13 including the step of constructing at least one of the pin end portions of a size smaller than the opening size and the medial portion size.
17. The method as defined in claim 13 wherein the pin is made of metal.
18. The method as defined in claim 14 wherein the opening size is substantially larger than the pin end portions size.
19. The method as defined in claim 15 wherein the medial portion size corresponds substantially to the opening predetermined size.
20. The method as defined in claim 14 wherein the pin end portions are each substantially cylindrical.
21. The method as defined in claim 15 wherein the pin end portions are each substantially cylindrical.
22. The method as defined in claim 16 wherein the pin end portions are each substantially cylindrical.
23. The method as defined in claim 17 wherein the pin end portions are each substantially cylindrical.
24. The method as defined in claim 18 wherein the pin end portions are each substantially cylindrical.
25. The method as defined in claim 19 wherein the pin end portions are each substantially cylindrical.
26. A shelf assembly comprising an elongated support member having front and rear end portions, means for defining a substantially vertical trackway along which said rear end portion can slide to effect vertical adjusting movement of said support member, cooperative latching means of said rear end portion for latching said support member at selected positions of adjustment along said trackway, and means carried by said rear end portion for increasing the lubricity thereof with respect to said trackway to thereby reduce the force required to adjust the support member relative to the trackway.
27. A shelf bracket comprising a shelf bracket member adapted to slide vertically in a trackway of a predetermined width, said shelf bracket member having a

forward end portion and a rear end portion, said rear end portion having a cross-sectional thickness substantially less than the width of an associated trackway whereby relatively undesired loose sliding movement would occur between the shelf bracket member rear end portion and the trackway unless otherwise provided, and means for defining a transverse enlargement at an area of said shelf bracket member rear end portion which increases the effective thickness at said area to substantially match an associated trackway predetermined width to thereby reduce shelf bracket sidewise movement when associated with a predetermined width trackway.

28. A pin particularly adapted for assembly to a shelf bracket member comprising an elongated member having axially opposite end portions, a medial portion between said axial opposite end portions and a collar between the medial portion and a first of said axial opposite end portions; said collar having a periphery larger than a periphery of said medial portion, said medial portion being of a peripherally larger size than the peripheral size of a second of said axial opposite end portions and defining therewith an annular shoulder and an annular volume of material of said medial portion between said annular shoulder, and said collar being sufficient when axially swaged toward said collar to form a second collar in adjacent spaced relationship to said first-mentioned collar.
29. A pin particularly adapted for assembly to a shelf bracket member comprising an elongated member having axially opposite end portions, a medial portion between said axial opposite end portions and a collar between the medial portion and a first of said axial opposite end portions; said collar having a periphery larger than a periphery of said medial portion, said medial portion being of a peripherally larger size than the peripheral size of a second of said axial opposite end portions and defining therewith an annular shoulder, and an annular volume of material of said medial portion between said annular shoulder and said collar being sufficient when axially swaged toward said collar to form a second collar in adjacent spaced relationship to said first-mentioned collar and having a periphery corresponding in size thereto.
30. The shelf support as defined in claim 26 wherein said rearward end portion includes upper and lower portions, said cooperative latching means are at least in part carried by the upper portion of said rearward end portion, and said lubricity increasing means is disposed at said rearward end portion lower portion.
31. A shelf bracket comprising an elongated member having rearward and forward end portions, an opening of a predetermined size in said rearward end portion, a pin, said pin having axially opposite ends, said

pin having a pin portion between said axially opposite ends, said pin portion being located in said opening, said pin portion including a pair of axially spaced collars each of a size larger than said opening, said elongated member rearward end portion being sandwiched between said collars, said pin having axially opposite end portions, a first of said axially opposite end portions being set-off between a first of said pin ends and a first of said collars, and a second of said axially opposite end portions being set-off between a second of said pin ends and a second of said collars whereby said axially opposite first and second pin end portions can engage an associated support.

32. The shelf bracket as defined in claim 31 wherein at least one of said collars is formed from the material of said pin.
33. The shelf bracket as defined in claim 31 wherein said collars are both formed from the material of said pin.
34. The shelf bracket as defined in claim 31 wherein said pin and at least one of said collars are constructed from a single piece of substantially homogeneous material.
35. The shelf bracket as defined in claim 31 wherein said pin and pair of collars are constructed from a single piece of substantially homogeneous material.
36. The shelf bracket as defined in claim 31 wherein at least one of said collars is formed from the material of said pin swaged from a size corresponding to said opening predetermined size to said larger collar size.
37. The shelf bracket as defined in claim 31 wherein at least one of said collars is swaged from a portion of the material of said pin portion.
38. The shelf bracket as defined in claim 31 wherein said first and second pin end portions are of substantially the same axial length.
39. The shelf bracket as defined in claim 32 wherein said pin and pair of collars are constructed from a single piece of substantially homogeneous material, and one of said pair of collars is swaged from the material of said pin portion.
40. The shelf bracket as defined in claim 36 wherein said pin and pair of collars are constructed from a single piece of substantially homogeneous material.
41. The shelf bracket as defined in claim 37 wherein said collars are both formed from the material of said pin.
42. The shelf bracket as defined in claim 37 wherein said pin and pair of collars are constructed from a single

piece of substantially homogeneous material.

- 43.** A shelf bracket comprising an elongated member having rearward and forward end portions, an opening of a predetermined size in said rearward end portion, a pin, said pin having axially opposite ends, a collar at one of said axially opposite ends, said pin having a pin portion between said collar and another of said axially opposite ends, said pin portion being located in said opening, another swaged collar spaced from said first-mentioned collar and said collars each being of a size larger than said opening, and said elongated member rearward end portion being sandwiched between said collars whereby an axial end portion of said pin projects away from said swaged collar and can engage an associated support. 5 10 15
- 44.** The shelf bracket as defined in claim 43 wherein said pin and at least one of said collars are constructed from a single piece of substantially homogeneous material. 20
- 45.** The shelf bracket as defined in claim 43 wherein said pin and pair of collars are constructed from a single piece of substantially homogeneous material. 25
- 46.** A pin particularly adapted for assembly to a shelf bracket member comprising an elongated member having axially opposite ends, a medial portion between said axial opposite ends, a collar at one of said ends adjacent the medial portion, said collar having a periphery larger than a periphery of said medial portion, said medial portion being of a peripherally larger size than the peripheral size of an axial end portion of said elongated member remote from said collar, and defining with said medial portion an annular shoulder, and an annular volume of material of said medial portion between said annular shoulder and said collar being sufficient when axially swaged toward said collar to form a second collar in adjacent spaced relationship to said first-mentioned collar. 30 35 40

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FIG. 1

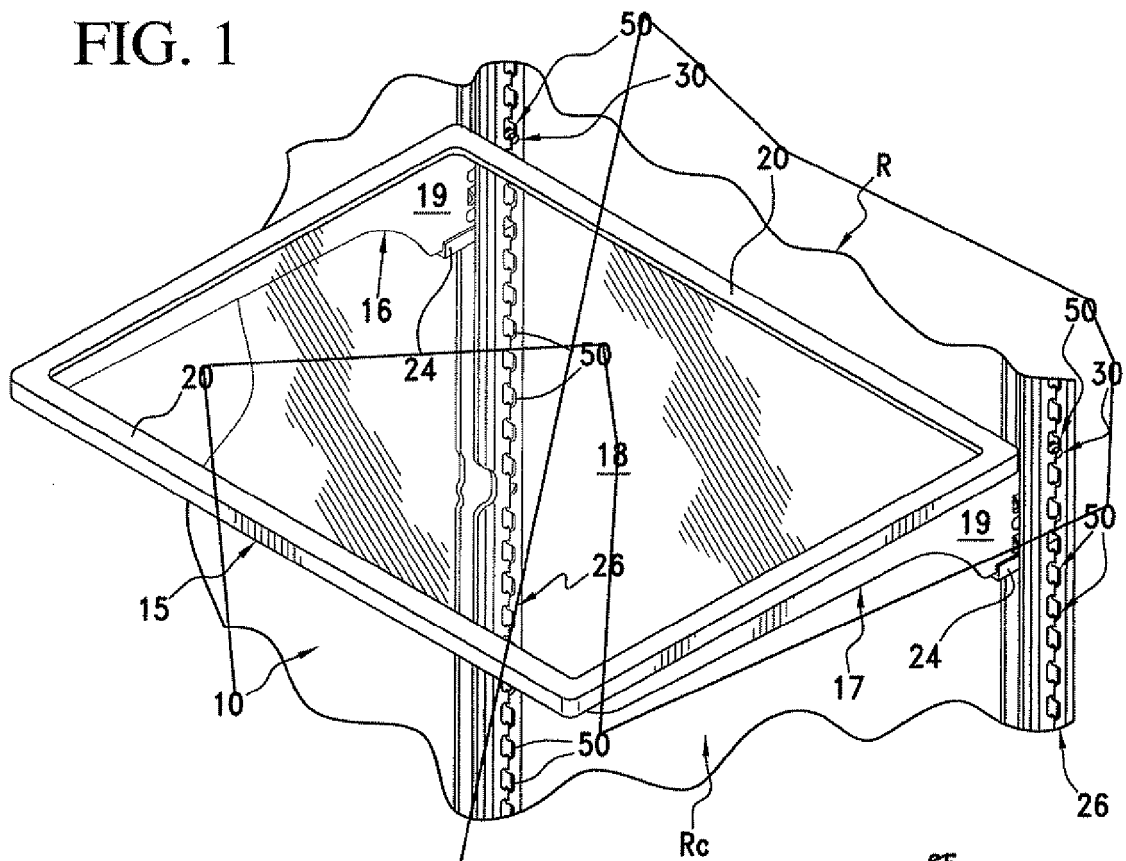


FIG. 3

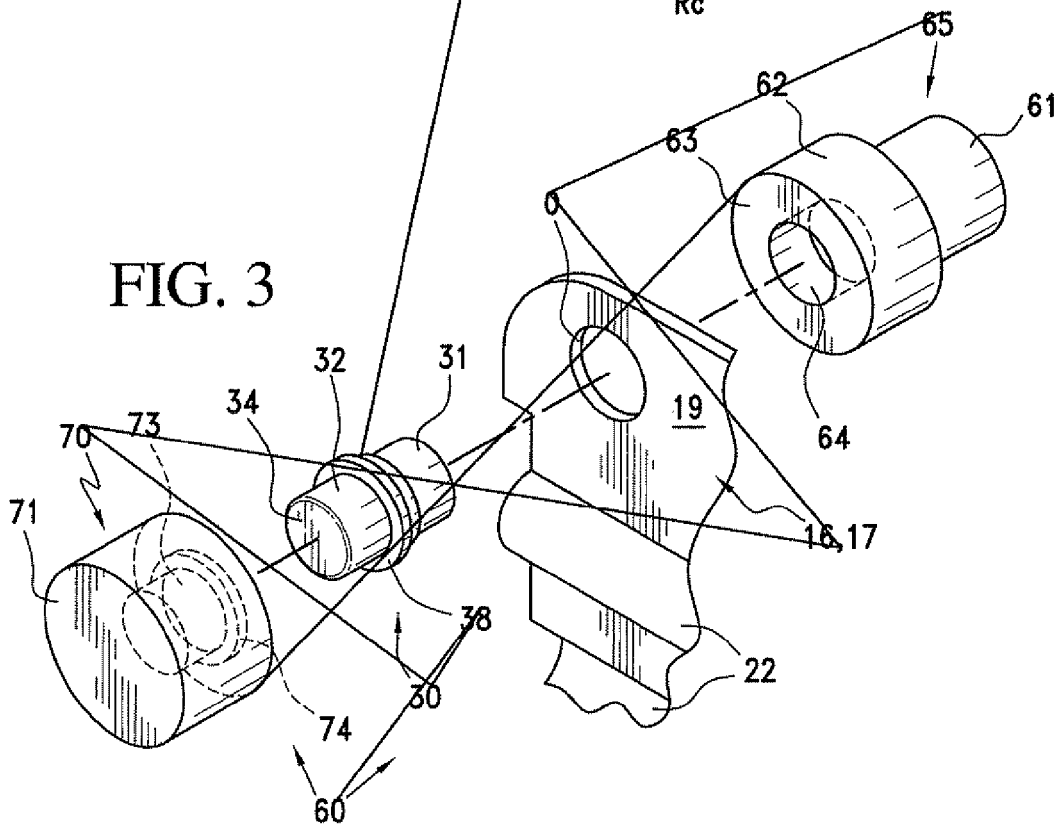
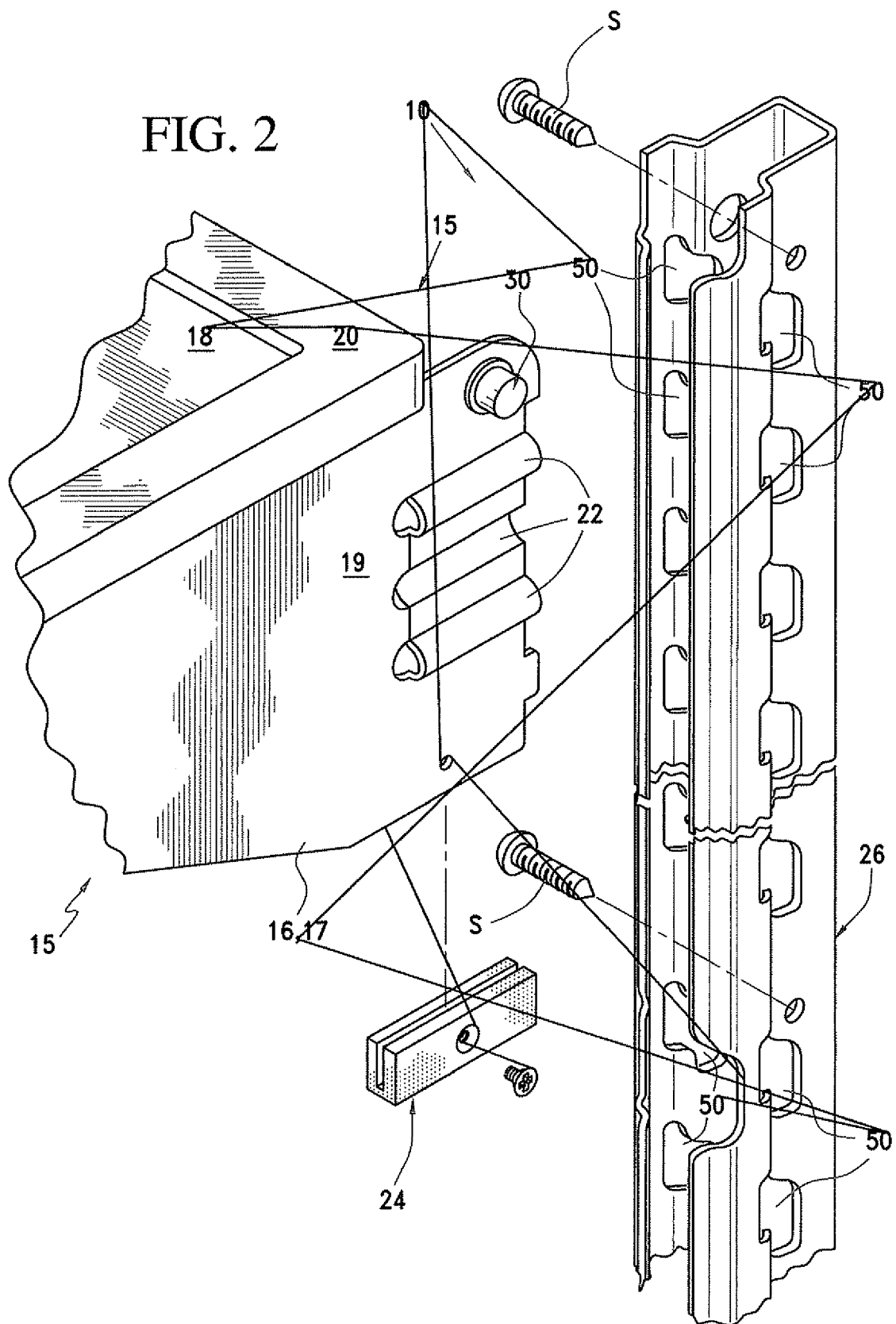


FIG. 2



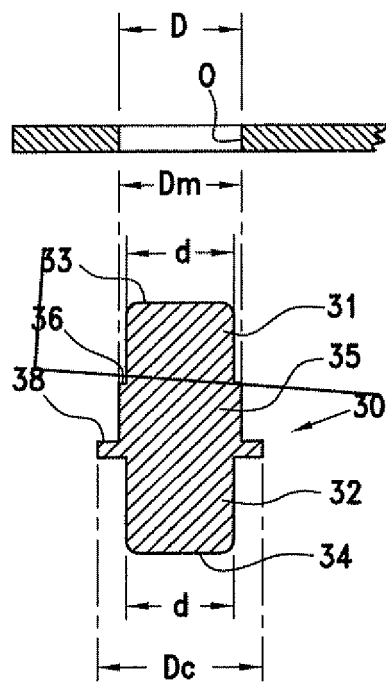


FIG. 4

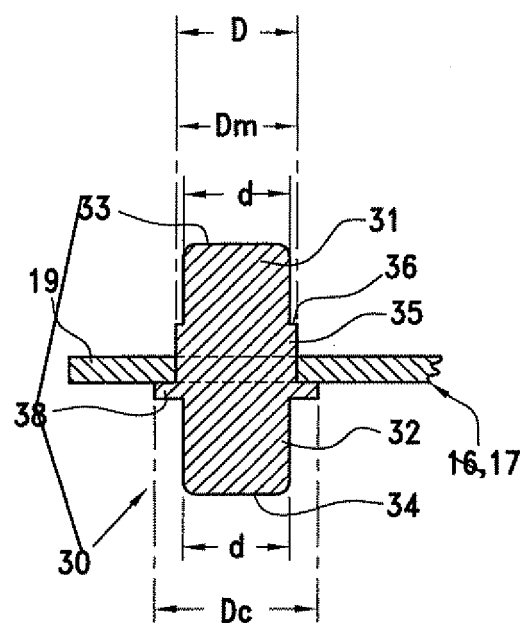


FIG. 5

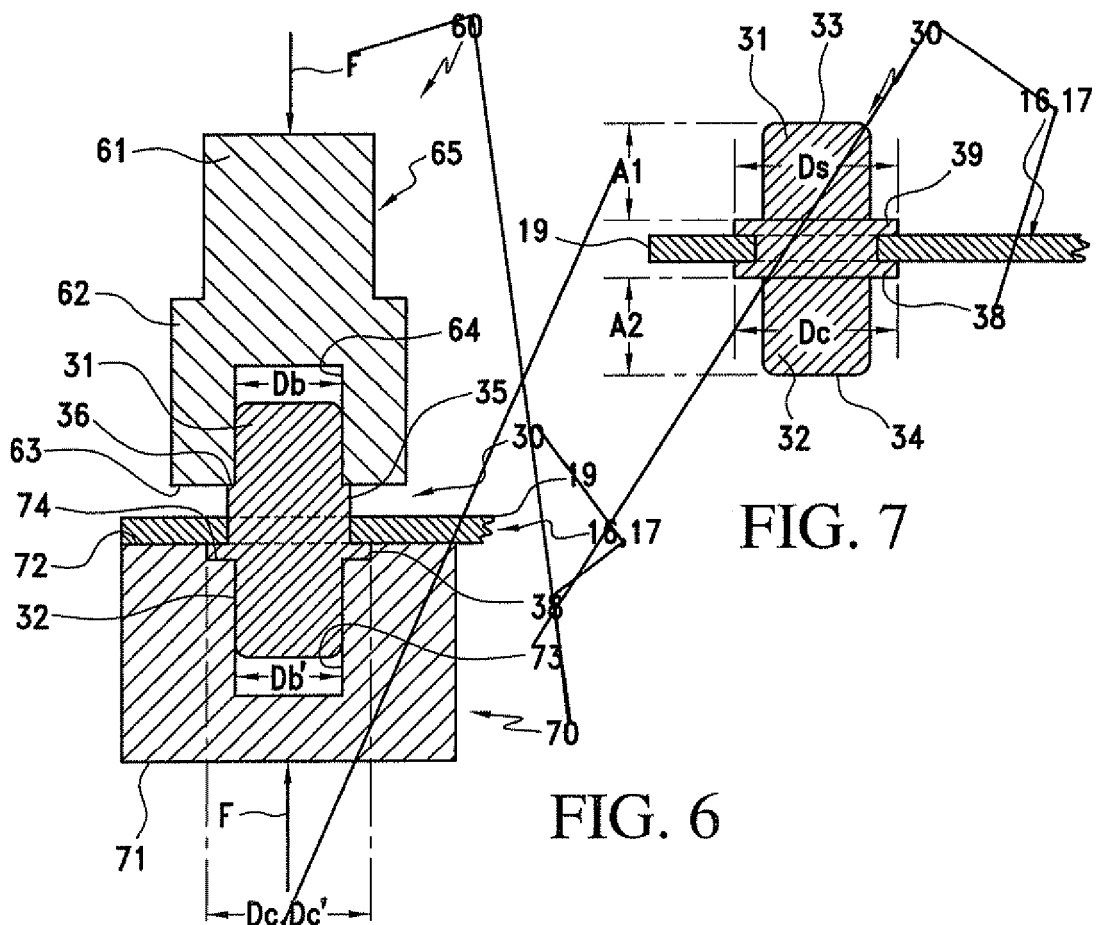


FIG. 7

FIG. 6



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 10 5560

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 July 2007	Examiner Klintebäck, Daniel
CATEGORY OF CITED DOCUMENTS 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 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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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