(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 April 2005 (21.04.2005)

PCT

(10) International Publication Number
WO 2005/035303 A1

(51) International Patent Classification[7]: B60N 2/46, A47C 7/54

(21) International Application Number: PCT/US2004/025501

(22) International Filing Date: 6 August 2004 (06.08.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/505,567 24 September 2003 (24.09.2003) US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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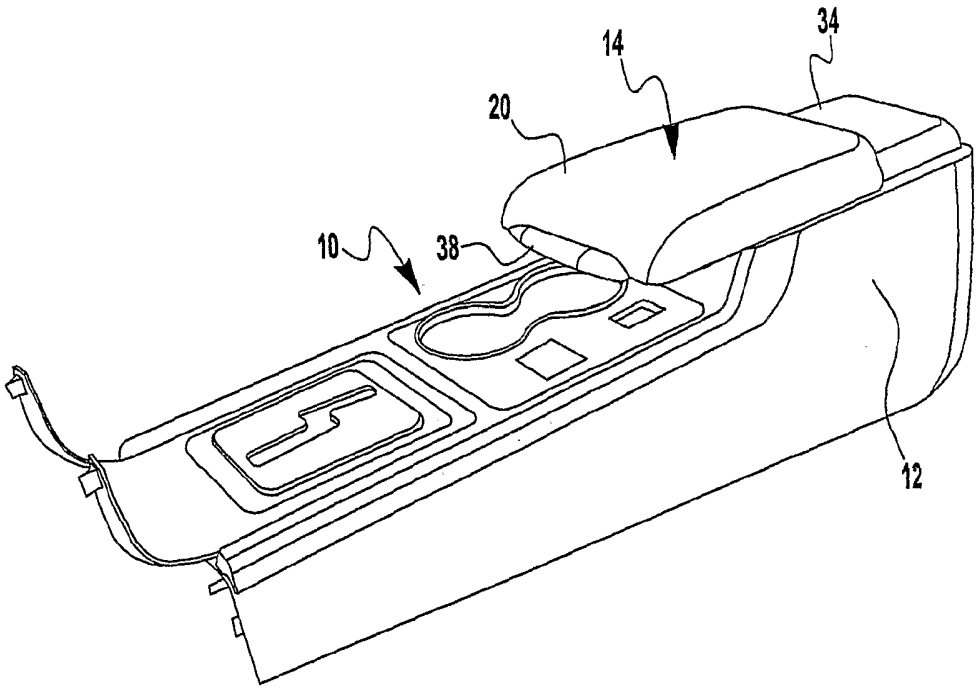
(54) Title: SLIDING ARMREST




(57) Abstract: A console (10) with an adjustable armrest (14) is disclosed. One or more sliding engagement members or tabs are biased to apply a traction or friction force to a longitudinal projection or rail. In one embodiment, the sliding members are disposed on a base pivotally coupled to the console and the rail extends from a bottom side of the armrest. The traction force is designed to inhibit undesired or inadvertent movement of the armrest yet allow for easy movement and adjustment of the armrest.

WO 2005/035303 A1

**Published:**
— *with international search report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# SLIDING ARMREST

## CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

**[0001]** The present invention claims priority from U.S. Provisional Patent Application No. 60/505,567 titled "Sliding Armrest With Biased Frictional Engagement Of Rail" filed 9/24/03 (Attorney Docket No. 026032-4605), the full disclosure of which is hereby incorporated herein by reference.

## FIELD

**[0002]** The present invention relates to a sliding armrest with biased frictional engagement of a surface to retain the armrest in a position desired by the user yet inhibit undesired or inadvertent movement.

## BACKGROUND

**[0003]** Armrests in vehicles such as automobiles are generally known. Such known armrests are sometimes pivotable to expose a storage compartment (e.g., a bin), but are not otherwise movable or adjustable. Additionally, placement and size of known armrests are designed to accommodate a deviation covering most adults. However, many occupants (or users of these armrests) are unable to enjoy the full use of known armrests because the user falls outside the deviation the armrest is designed to accommodate. Also, many users of known armrests would prefer a different configuration of their armrest, instead of that which has been designed "for" them.

**[0004]** Although it is known to provide a sliding armrest with a retention force that is applied to outer flanges along a substantial length of the armrest, this configuration often fails to retain the armrest in the desired position during vehicle movement or when contacted because of inadvertent movements by users or vehicle passengers. Also, such known sliding armrests do not provide for a smooth operation or an economical assembly.

**[0005]** Accordingly, it would be advantageous to provide an armrest that is adjustable by the user, particularly pivotal and/or forward and aft translational movement. It would also be advantageous to provide a sliding armrest or other trim component that provides a constant resistance to movement with traction or friction applied between the

armrest and the console. It would further be advantageous to provide a sliding armrest that provides for smooth movement of the armrest by application of a predetermined, constant force by the user and yet inhibits undesired movement due to motion of the vehicle, or other forces. It would further be advantageous to provide for a sliding armrest that is easier to assemble and provides a smoother operation. To provide an inexpensive, reliable, and widely adaptable adjustable armrest that avoids the above-referenced and other problems would represent a significant advance in the art.

## SUMMARY

**[0006]** A primary feature of the present invention is to provide an inexpensive, easy-to-manufacture and assemble, and aesthetically-pleasing infinitely or discretely adjustable armrest that overcomes the above-noted disadvantages.

**[0007]** Another feature of the present invention is to provide an armrest that provides for translational adjustment forward and rearward of a vehicle.

**[0008]** Another feature of the present invention is to provide an adjustable armrest with a biased frictional engagement for sturdy and easy adjustment.

**[0009]** The present invention relates to an armrest configured for translational adjustment by application of a predetermined or designed amount of force by the user wishing to adjust the position of the armrest. The resistance to movement is provided by a traction or friction force applied to a sliding member by one or more biased engagement members.

**[0010]** The present invention also relates to an armrest coupled to a console and configured for movement forward and aft. The console includes a pair of engagement members with traction pads that are biased to engage a rail on the armrest.

**[0011]** The present invention further relates to a console with an adjustable armrest. One or more engagement members are biased to apply a traction or friction force to a longitudinal projection or rail. In one embodiment, the engagement members are disposed on a base pivotally coupled to the console and the rail extends from a bottom side of the armrest.

**[0012]** The present invention further relates to an adjustable armrest comprising a base, a sliding member coupled to the base, a frictional engagement mechanism comprising a first projection and at least one engagement member, and at least one second projection

extending from one of the base and the sliding member and located between edges that are generally parallel to the direction of movement of the sliding member. The second projection is at least partially located between the first projection and the engagement member and the engagement member is biased toward the first projection to provide a frictional force on the second projection that inhibits movement of the sliding member.

**[0013]** The present invention further relates to an adjustable armrest comprising a base, an armrest slidably coupled to the base, a frictional engagement mechanism mounted to one of the base and the armrest and configured to retain the armrest in a position between an extended position and a retracted position, the frictional engagement mechanism comprising a first projection and at least one engagement member, and at least one second projection extending from one of the base and the sliding member. The at least one second projection is disposed between the first projection and the at least one engagement member and the at least one engagement member applies a force to the at least one second projection to resist movement of the armrest, and further wherein the armrest is slidable upon application of a force sufficient to overcome the friction force.

**[0014]** The present invention further relates to various features and combinations of features shown and described in the disclosed embodiments.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0015]** FIGURE 1 is a perspective view of a console with a sliding armrest in a stowed or rearward position according to a preferred embodiment.

**[0016]** FIGURE 2 is a perspective view of a console with the sliding armrest of FIGURE 1 but in a deployed or forward position.

**[0017]** FIGURE 3 is a perspective view of a console with the sliding armrest in a stowed or rearward position.

**[0018]** FIGURE 4 is a perspective view of a console with the sliding armrest in a deployed or forward position.

**[0019]** FIGURE 5 is a bottom plan view of the sliding member.

**[0020]** FIGURE 6 is a top plan view of the base.

**[0021]** FIGURE 7 is a top plan view of the sliding member.

**[0022]** FIGURE 8 is a bottom plan view of the base.

**[0023]** FIGURE 9 is a top perspective view of the base.

**[0024]** FIGURE 10 is a fragmentary perspective view of a side portion of the base.

**[0025]** FIGURE 11 is an exploded view of the base.

**[0026]** FIGURE 12 is a fragmentary perspective view of the base.

**[0027]** FIGURE 13 is a fragmentary exploded view of an engagement mechanism.

**[0028]** FIGURE 14 is a fragmentary top plan view of a rail according to a preferred embodiment.

**[0029]** FIGURE 15 is a fragmentary top plan view of the base and engagement mechanism according to a preferred embodiment.

## DETAILED DESCRIPTION OF PREFERRED AND OTHER EXEMPLARY EMBODIMENTS

**[0030]** Before proceeding to the detailed description of the preferred and exemplary embodiments, several comments can be made about the general applicability and the scope thereof. For example, while the components of the disclosed embodiments will be illustrated as an adjustable armrest designed for a center console in an automobile, the features of the disclosed embodiments have a much wider applicability. For example, the adjustable armrest design is adaptable for any of a variety of vehicle types (e.g., SUVs, vans, trucks, watercraft, aircraft, recreational vehicles, etc.), for other locations within a vehicle (e.g., along a door, in the rear passenger compartment, aviation applications, etc.), for seating arrangements not located in vehicles (e.g., movie theaters, and other office, home, or educational seating arrangements which employ an armrest). Further, the size of the various components and the size of the armrests can be widely varied.

**[0031]** Also, the particular materials used to construct the exemplary embodiments are also illustrative. For example, injection molded acrylonitrile butadiene styrene ("ABS") is the preferred method and material for making the substrate, but other materials can be used, including other thermoplastic resins such as polypropylene, other polyethylenes, polycarbonate, polyurethane nylon, any of a variety of homopolymer plastics, copolymer plastics, plastics with special additives, filled plastics, etc. Also, other molding operations may be used to form these components, such as blow molding, rotational molding, etc. Components of the armrest can also be manufactured from other alloy materials such as steel or aluminum (e.g., stamped, cast, milled, machined, powdered metal, etc.). Also, the

material selection is dependent on the desired strength and the intended performance of the adjustable armrest.

**[0032]** Further, the guide mechanisms or slide assemblies may be any of a variety of devices or designs configured to provide a friction or traction force to a member sliding against it.

**[0033]** Further, it is important to note that the term "rail," "liner," and "substrate" are intended to be broad terms and not terms of limitation. These components may be used with any of a variety of products or arrangements and are not intended to be limited to use with automobile or even vehicle applications.

**[0034]** Proceeding now to descriptions of the preferred and exemplary embodiments, FIGURES 1 and 2 show a center console 10 for a vehicle. Center console 10 includes a storage enclosure or bin 12, a sliding member (e.g., an armrest assembly) 14, and a base 16. Bin 12 may have any of a variety of conventional configurations and orientations. Alternatively, console 10 does not have a "bin" and yet still includes an adjustable armrest. During use, a predetermined level of force is required to overcome a traction or friction force applied by an interface member (e.g., a tab or pad) pressed against a member in order to move a vehicle interior component (e.g., an armrest or other trim component). For example, the FIGURES illustrate a sliding armrest with a biased frictional engagement of a center rail type projection for alignment and guided movement.

**[0035]** Referring to FIGURES 5 and 7, sliding armrest assembly 14 is configured to move between a forward position (FIGURES 2 and 4) and a rearward or aft position (FIGURES 1 and 3) (e.g., telescope, slide, translate, etc.). Armrest assembly 14 includes a skin 20 (e.g., fabric, leather, sheet, etc.) and foam mounted to a substrate or liner 22 and a rail 24. Rail 24 includes two projections or alignment ribs 26, 28 and two projections or guide flanges 30, 32. Ribs 26, 28 are located in the center of rail 24 and are configured to provide lateral stability and center alignment of armrest assembly 14. Guide flanges 30, 32 are located along lateral edges of rail 24 and are configured to engage base 16 to provide vertical stability. According to a preferred embodiment, rail 24 (and its attached components if integrally molded) is injection molded acrylonitrile butadiene styrene ("ABS"). Alternatively, the rail is molded from any of a variety of plastics (e.g., polypropylene or other polymers) or metals.

**[0036]** According to an alternative embodiment, the armrest is discretely adjustable along its range of travel. In such an embodiment, the ribs comprise one or more (e.g., a series) of recesses to engage projections (e.g., detents, bumps, etc.) on the base and/or the interface member to secure or retain or lock the armrest in place (or one or more projections on base to engage recesses in the armrest, etc.). For example, spring loaded detents may be used to provide discrete locking positions.

**[0037]** Also, the surface upon which the friction interface members bear against may be centrally located on the armrest (as shown), off-center, or the like. According to alternative embodiments, the friction interface members bear against any of a variety of surfaces or members (e.g., a single projection or rail, multiple projections or rails, surfaces or other components, etc.).

**[0038]** Referring to FIGURES 6, 8, 9, and 11-15, base 16 includes a substrate 34, a hinge close out 36, a latch 38, flange guides 40, 42, and an armrest or sliding interface 44(e.g., frictional engagement mechanism).

**[0039]** According to a preferred embodiment, substrate 34 is molded plastic and is configured to provide a mounting surface for other components and a cover to inhibit access (visual or physical) when the armrest is moved to the forward position. According to an exemplary embodiment, substrate 34 is injection molded filled polypropylene.

**[0040]** Hinge 36 pivotally couples base 16 to bin 12 so that base 16 (and armrest assembly 14) pivot or rotate to allow access (visual and/or physical) to the storage space in the storage enclosure. Hinge 36 may be a single axis hinge (as shown) or may have any of a variety of hinge arrangements (e.g., a multiple-jointed hinge) to provide different functionality and operation.

**[0041]** Latch 38 pivots to release base 16 from console 10 so that base 16 (and the armrest) can pivot about hinge 36. Latch 38 may be any of a variety of conventional designs such as a handle and hook design as shown in the FIGURES. To pivot the armrest, the user operates latch 38 (e.g., grips or squeezes the handle against the armrest), and lifts.

**[0042]** Outer flange guides 40, 42 on base 16 are configured to slidably receive outer guide flanges 30, 32 on armrest assembly 14. Engagement of outer flange guides 40, 42 with guide flanges 30, 32 is intended to provide alignment of the armrest relative to the base 16 and translational movement stability (e.g., "play" that would allow the armrest to move in a "non-fore/aft direction). Flange guides 40, 42 are shown as metal brackets 45, 47

coupled to substrate 34 with inner rail guides 48, 49 captured within flange guides 40, 42 (e.g., to provide a reduced friction sliding interface). According to an exemplary embodiment, flange guides 40, 42 and/or rail guides 48, 49 are integrally molded with substrate 34.

**[0043]** According to an alternative embodiment, armrest alignment and translational stability is provided by linear guides that are not integrated with the armrest and substrate, but are separate components (e.g., commercially available linear guide and the like). The linear guides may also include ball bearings, low friction polymers, or the like to allow smooth translating sliding movement of the armrest.

**[0044]** Sliding interface 44 releasably couples armrest assembly 14 to base 16. Sliding interface 44 includes a projection or guide member 50 (shown as a center column) and a pair of opposed engagement members 52, 54. As shown in the FIGURES, the frictional engagement occurs in a horizontal direction. Alternatively, the sliding interface may be configured to occur in a vertical direction.

**[0045]** Guide member 50 is configured to engage the pair of alignment ribs 26, 28 by being inserted between ribs 26, 28 so that the armrest can slide along or against guide member 50 and flange guides 40, 42. The sliding engagement of guide member 50 and ribs 26, 28 is intended to provide additional stability and decrease or minimize non-linear forward/rearward movement of the armrest. According to a preferred embodiment, guide member 50 is integrally molded with substrate 34.

**[0046]** According to an exemplary embodiment, engagement members 52, 54 are located in receptacles 56, 58 (e.g., pockets, recesses, etc,) on opposite or opposing sides of guide member 50. Engagement members 52, 54 are biased to apply a predetermined or controlled, constant force (e.g., a friction force) to alignment ribs 26, 28 on the armrest.

**[0047]** Engagement members 52, 54 are preferably biased by biasing members, shown as springs 64, 66 (e.g., coil springs). According to an alternative embodiment, the engagement members are biased by leaf springs, a spring leg molded into the friction member or receptacle, an interference fit, or the like. As appreciated by someone having ordinary skill in the art reviewing this disclosure, the springs may be selected to provide any of a variety of biasing or spring forces (i.e., having a pre-selected spring constant) to provide a desired resistance to movement of the armrest relative to the base (e.g., the alignment ribs sliding against the pads for the engagement members).

**[0048]** Receptacles 56, 58 receive engagement members 52, 54 (and pads 60, 62) and springs 64, 66. The walls that define receptacles 56, 58 include an opening for engagement members 52, 54 to extend from when biased by springs 64, 66 to engage alignment ribs 26, 28 on armrest assembly 14. Receptacles 56, 58 are preferable integrally molded in substrate 34.

**[0049]** According to a preferred embodiment, pads 60, 62 (e.g., friction or traction pads) are coupled to engagement members 52, 54 and located between engagement members 52, 54 and alignment ribs 26, 28. As such, pads 60, 62 are configured to provide increased traction or friction between engagement members 52, 54 and alignment ribs 26, 28. As appreciated by someone having ordinary skill in the art reviewing this disclosure, the pads may be selected to provide any of a variety of resistance to movement of the armrest relative to the base (e.g., the alignment ribs sliding against the pads for the engagement members). Pads 60, 62 may be bonded to ends of engagement members 52, 54 (e.g., adhesive, thermo bonding or fusion, ultrasonic welding, etc.). Preferably, pads 60, 62 are coupled to engagement members 52, 54 by complementary interlocking geometry or design such as a protrusion engaging a groove or channel (e.g., a "t"-shaped channel in the pads receive a "t"-shaped rib on the engagement member). Alternatively, the pads may be attached to the engagement members by fasteners (e.g., screw, tack, rivet, etc.) or other mechanical means. According to an alternative embodiment, engagement members 52, 54 engage ribs 26, 28 without the use of pads 60, 62. Alternatively, pads 60, 62 are integrally molded to the engagement members (e.g., in a separate molding operation). According to a preferred embodiment, the engagement members are made from a rubber composite (cross-linked or non-cross-linked). According to a particularly preferred embodiment, the pads are a polypropylene and ethylene propylene diene monomer (EPDM) composite (e.g., SANTOPRENE commercially available from Advanced Elastomers of Akron, Ohio or SARLINK commercially available from DSM Elastomers of Leominster, Maryland). Alternatively, the pads may be die cut from a roll of sheet material and coupled or bonded to the engagement members.

**[0050]** According to an alternative embodiment, engagement members 52, 54 and receptacles 56, 58, pads 60, 62, and springs 64, 66 are aligned and (extend) vertically on the substrate and frictionally engage (e.g., "touch off") the bottom surface of the armrest.

Alternatively, the engagement members can extend from the armrest to frictionally engage the substrate.

**[0051]** According to an alternative embodiment as shown in FIGURES 14 and 15, sliding interface 110 (e.g., a frictional engagement mechanism) couples base 16 to sliding member 14. Rail 78 includes projections or alignment ribs 70, 72. Alignment ribs 70, 72 include tapers 74, 76 at one or both ends to facilitate assembly or installation of the alignment ribs into the sliding interface 110. Sliding interface 110 includes a projection or guide member 80, interface members 82, 84, and traction or friction pads 90, 92. Sliding interface 110 is configured to have gaps 98, 100 between guide member 80 and friction pads 90, 92 to facilitate assembly. The size of gaps 98, 100 is controlled or defined by the size of spacer elements 102, 104 that are installed between the side of the pockets or receptacles 86, 88 and the interface members 82, 84.

**[0052]** According to a particularly preferred embodiment, the width of gaps 98, 100, measured along a line orthogonal to the interface surfaces of traction or friction pads 90, 92 and guide member 80, is between about 1 and 3 millimeters, and preferably about 2 millimeters. Biasing members or springs 94, 96 bias interface members 82, 84 and are housed within receptacles 86, 88. According to alternative embodiments, the size of the gap may be any of a variety of dimensions depending on desired performance and manufacturing or assembly operations. To assemble the armrest assembly, the tapers 74, 76 are coupled with sliding interface 110 by inserting the tapered ends of alignment ribs 70, 72 into gaps 98, 100 so that the traction pads 90, 92 fully engage the alignment ribs.

**[0053]** According to an exemplary embodiment, stops may be provided to inhibit travel (or the range of the travel) of the armrest (e.g., to prevent the armrest from being extended too far forward such that it becomes disengaged from the console), or the like.

**[0054]** To adjust the translational position of the armrest, the user applies sufficient force to the armrest in either the forward or rearward direction to overcome the friction or traction force between the rail projection and the pads/engagement members.

**[0055]** It is also important to note that the construction and arrangement of the elements of the sliding armrest with biased frictional engagement of a center rail as shown in the preferred and other exemplary embodiments are illustrative only. Although only a few embodiments of the present invention have been described in detail in this disclosure, those skilled in the art who review this disclosure will readily appreciate that many

modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter disclosed herein. For example, the frictional resistance may be provided to allow adjustment of any of a variety of vehicle components besides armrests (e.g., other trim pieces, head rests, seats, and the like). Also, the projection or rail may be located on the base and the friction member(s) may be located on the armrest. Accordingly, all such modifications are intended to be included within the scope of the present invention. The order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments. Any functional description herein is intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. Other substitutions, modifications, changes and/or omissions may be made in the design, operating conditions and arrangement of the preferred and other exemplary embodiments without departing from the spirit of the present invention.

**WHAT IS CLAIMED IS:**

1. An adjustable armrest comprising:

a base;

a sliding member coupled to the base;

a frictional engagement mechanism comprising a first projection and at least one engagement member; and

at least one second projection extending from one of the base and the sliding member and located between edges that are generally parallel to the direction of movement of the sliding member;

wherein the second projection is at least partially located between the first projection and the engagement member and the engagement member is biased toward the first projection to provide a frictional force on the second projection that inhibits movement of the sliding member.

2. The armrest of claim 1 wherein the sliding member is infinitely adjustable between a first position and a second position.

3. The armrest of claim 2 wherein the sliding member may be frictionally retained at any point between the first position and the second position.

4. The armrest of claim 1 wherein the at least one second projection comprises a pair of spaced apart ribs.

5. The armrest of claim 4 wherein the first projection is a guide configured to direct the motion of the ribs.

6. The armrest of claim 5 wherein the guide is centrally located between the edges of the one of the base and the sliding member.

7. The armrest of claim 1 wherein the at least one second projection is at least partially located between the first projection and the at least one engagement member along the entire range of movement of the sliding member.

8. The armrest of claim 1 wherein the first projection extends from the base and the at least one second projection extends from the sliding member.

9. The armrest of claim 1 wherein each edge engages a rail guide.

10. A console for use in a vehicle comprising:

a base coupled to the vehicle;

an armrest slidably coupled to the base;

a frictional engagement mechanism mounted to one of the base and the armrest and configured to retain the armrest in a position between an extended position and a retracted position, the frictional engagement mechanism comprising a first projection and at least one engagement member; and

at least one second projection extending from one of the base and the sliding member;

wherein the at least one second projection is disposed between the first projection and the at lease one engagement member and the at least one engagement member applies a force to the at least one second projection to resist movement of the armrest, and further wherein the armrest is slidable upon application of a force sufficient to overcome the friction force.

11. The console of claim 10 wherein the friction force is generally constant.

12. The console of claim 10 wherein the engagement member is biased toward the at least one second projection.

13. The console of claim 10 further comprising at least one receptacle configured to receive and to guide the movement to the at least one engagement member.

14. The console of claim 13 wherein the receptacle is defined by a plurality of walls extending from the base.

15. The console of claim 10 wherein the frictional engagement mechanism further comprises a friction pad coupled to the at least one engagement member.

16. The console of claim 15 wherein the friction pad frictionally engages the second projection.

17. The console of claim 10 wherein the frictional engagement mechanism further comprises a biasing member configured to bias the at least one engagement member against the second projection.

18. The console of claim 17 wherein the biasing member comprises a spring configured to provide a constant biasing force.

19. The console of claim 10 wherein the frictional engagement mechanism is configured to maintain a gap between the at least one engagement member and the first projection when the sliding member is not coupled to the base.

20. The console of claim 19 wherein at least one end of the at least one second projection comprises a taper surface.

21. The console of claim 20 wherein the gap and the taper surface are configured to facilitate assembly of the sliding member to the base.

22. The console of claim 21 wherein the size of the gap is defined by a spacer located between the at least one engagement member and the sliding member.

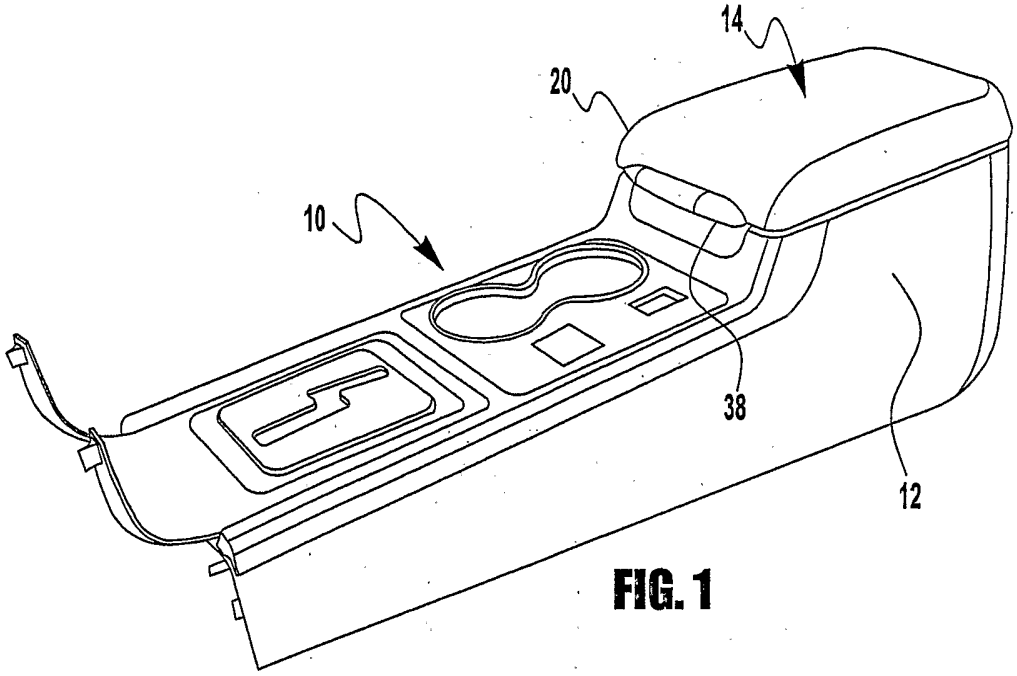



FIG. 1

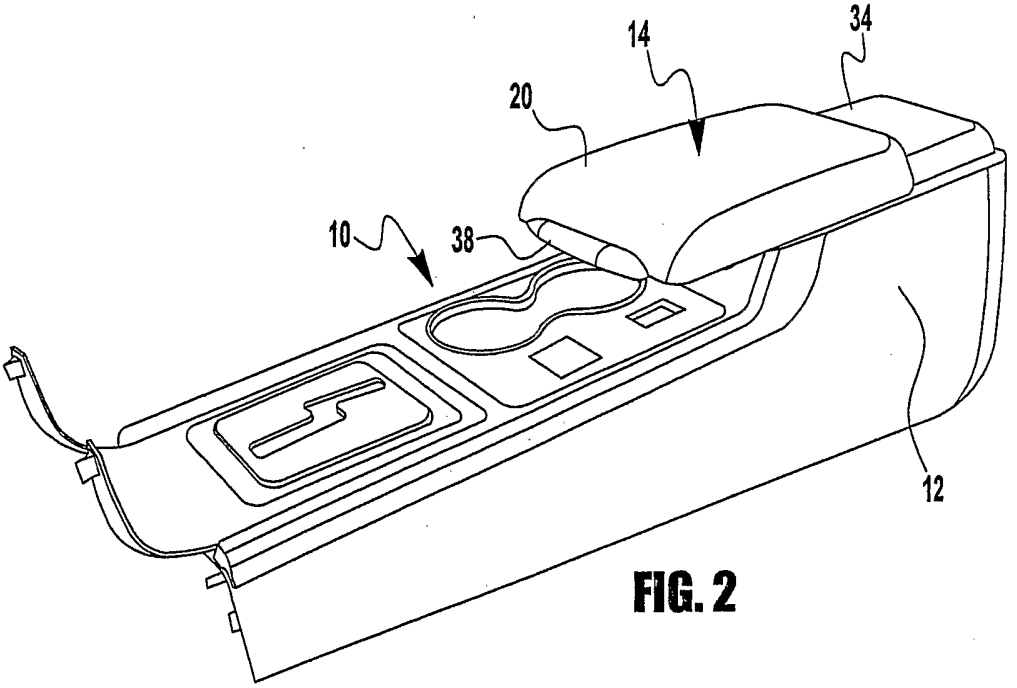



FIG. 2

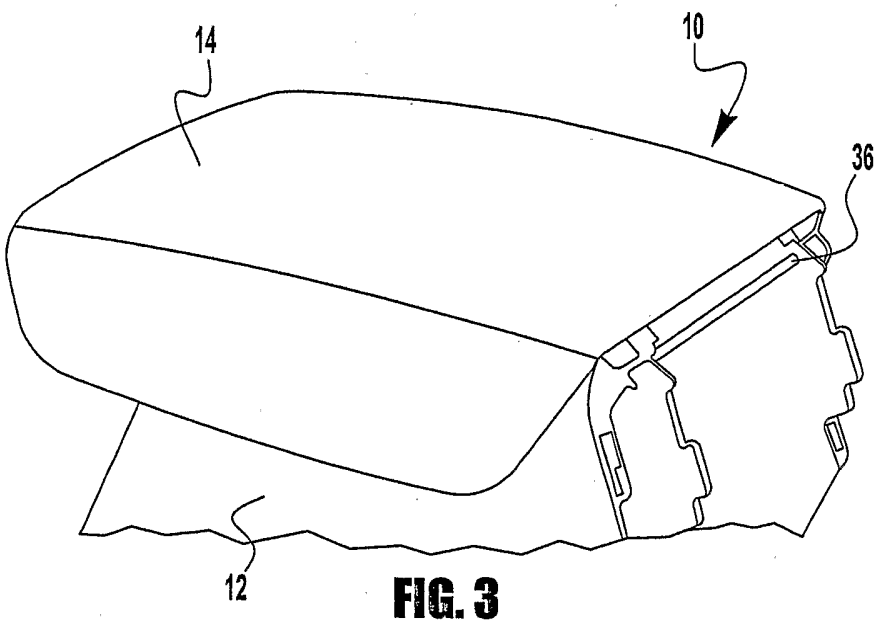



FIG. 3

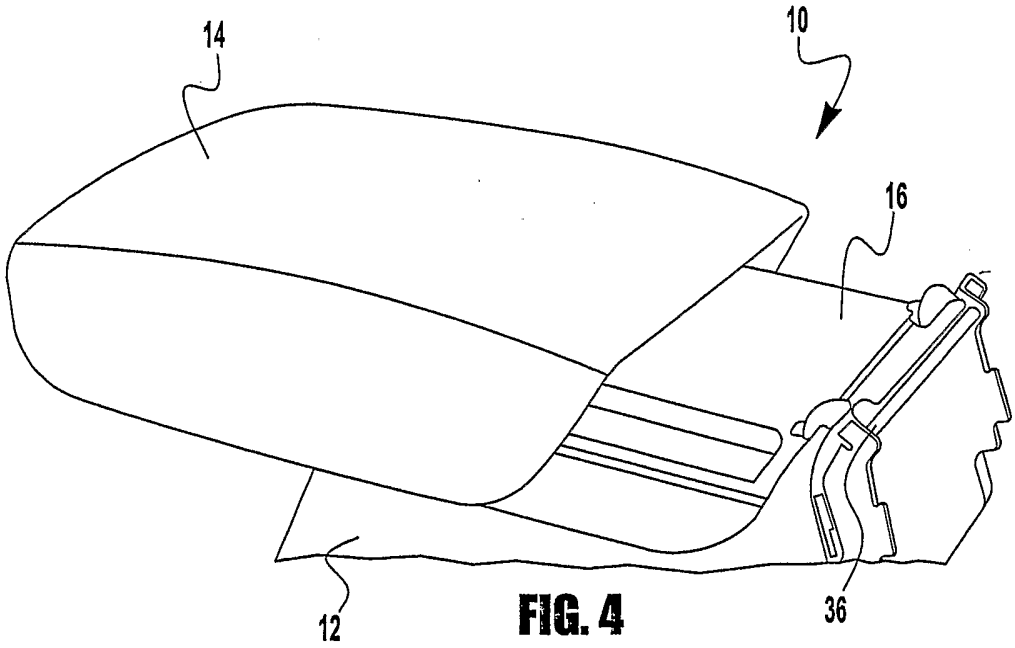



FIG. 4

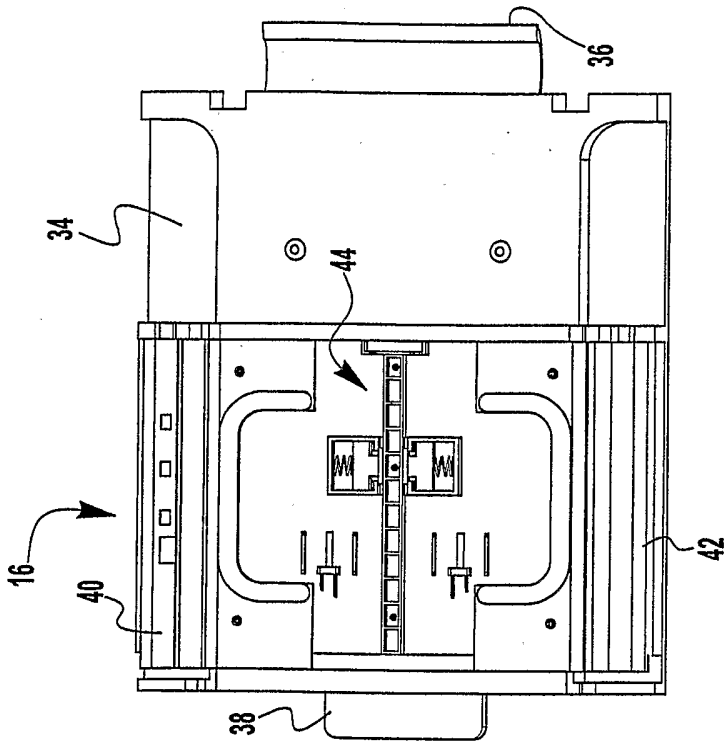



FIG. 6

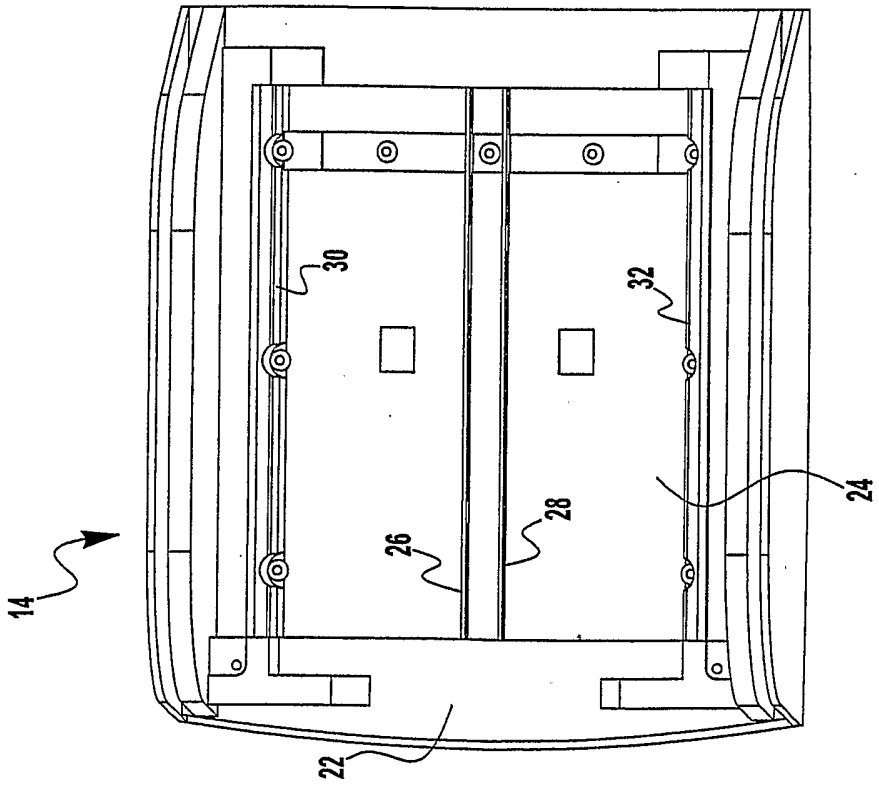



FIG. 5

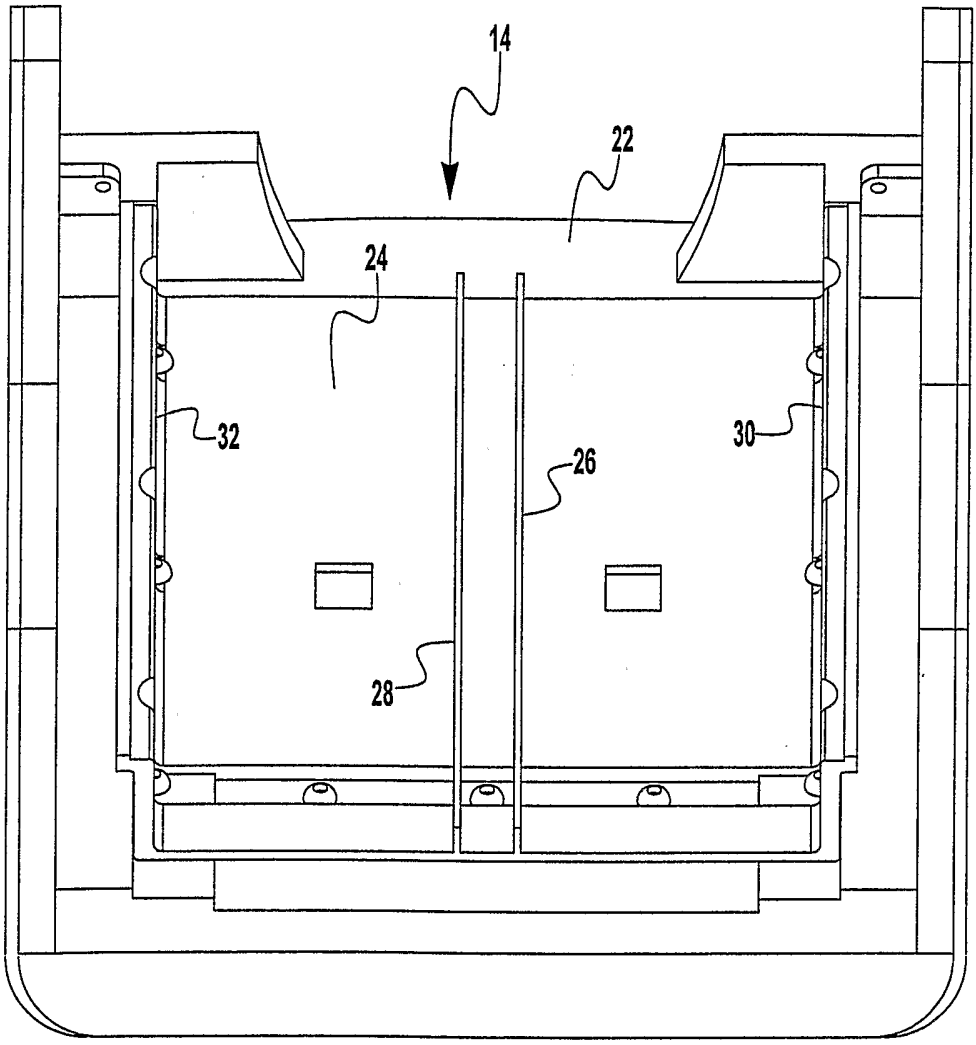
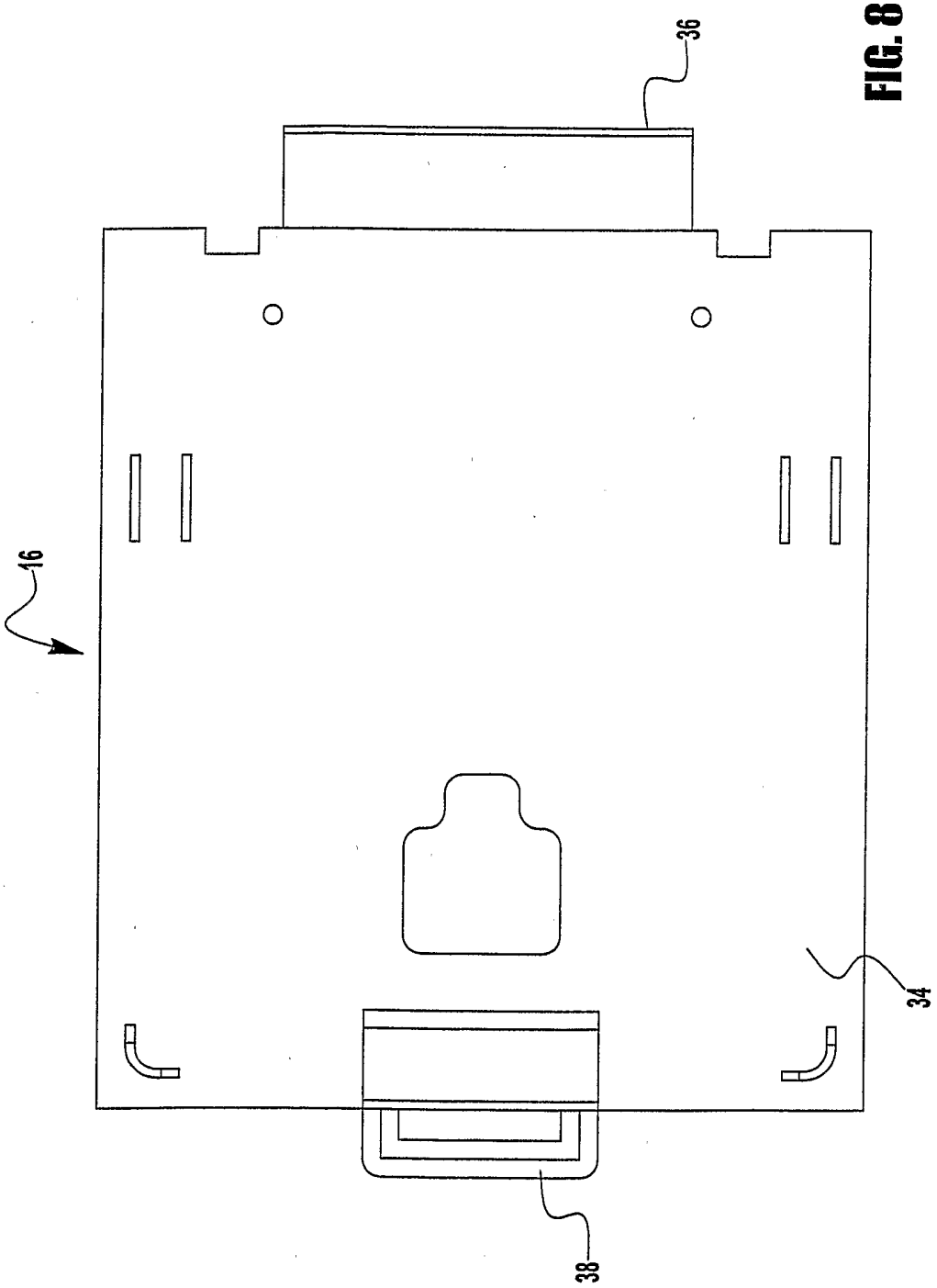



FIG. 7

FIG. 8



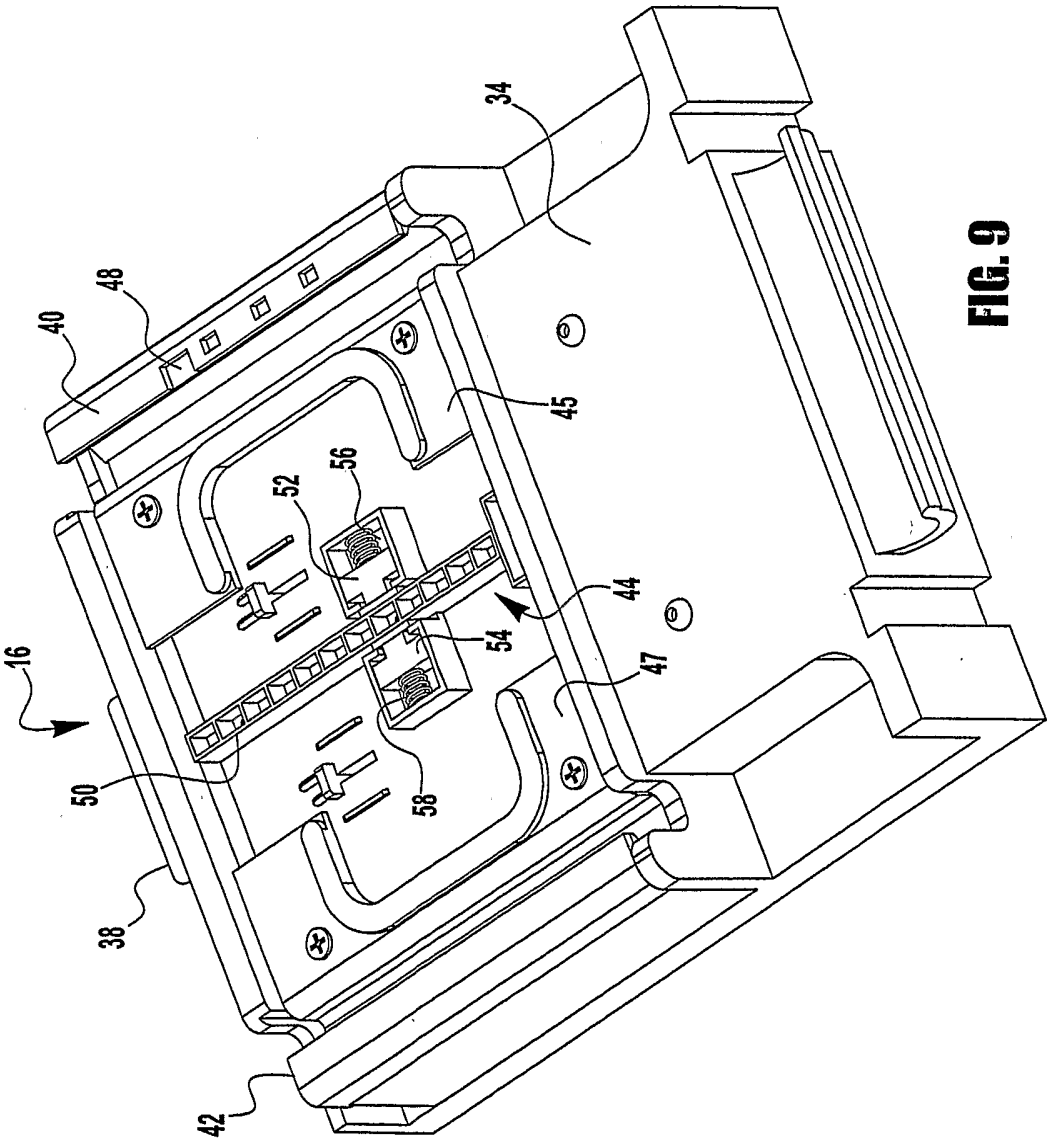



FIG. 9

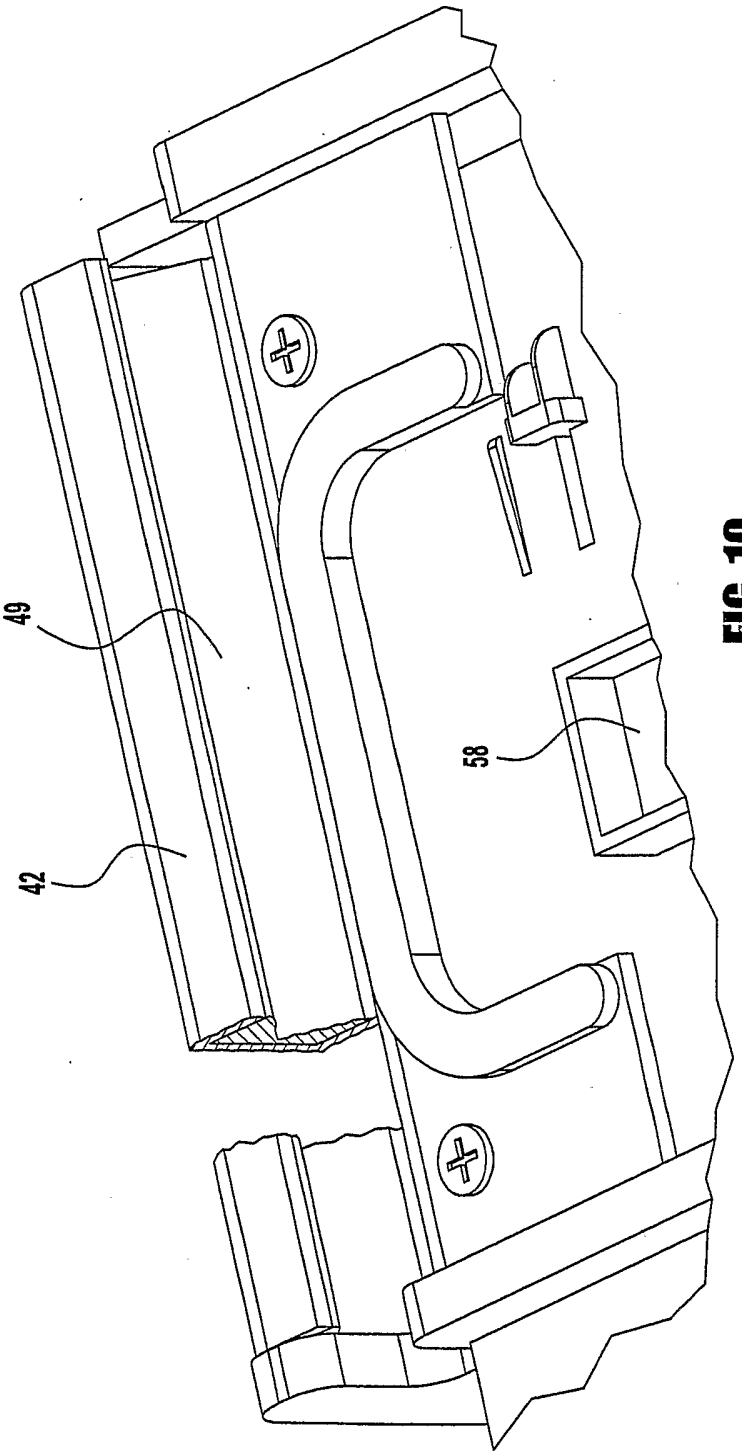



FIG. 10

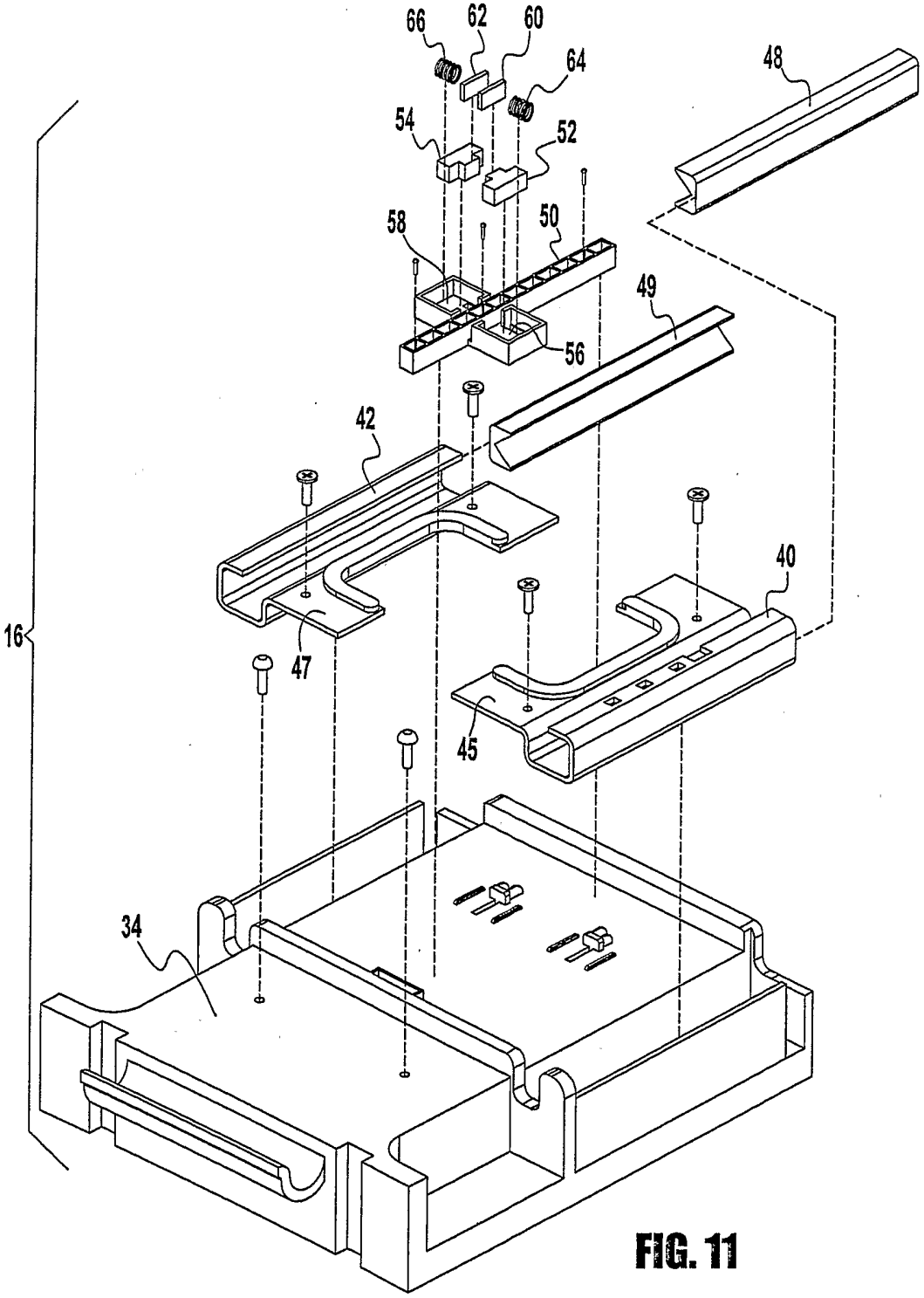



FIG. 11

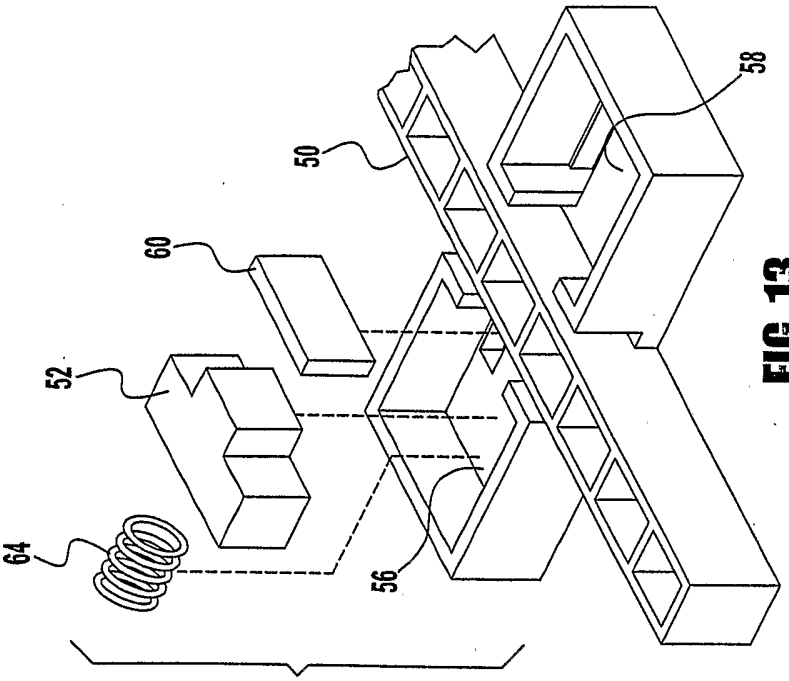



FIG. 13

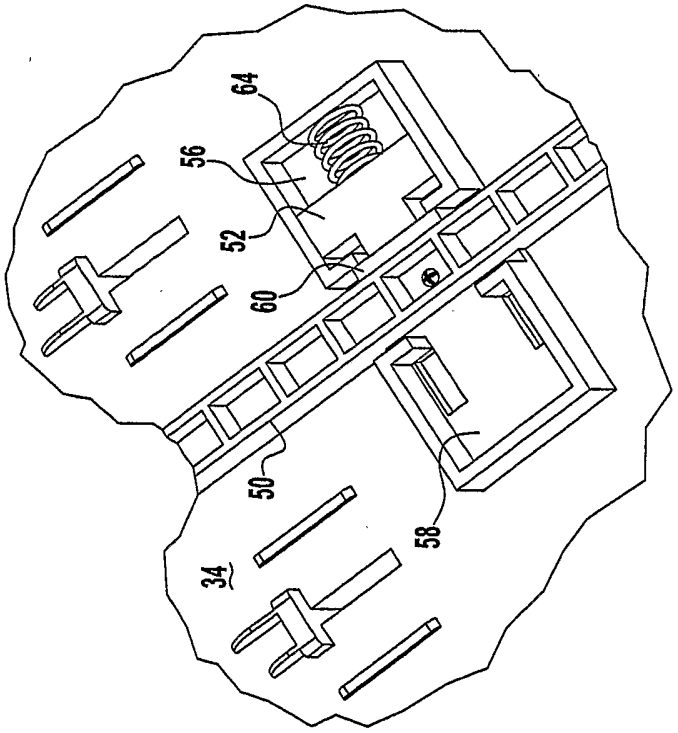



FIG. 12

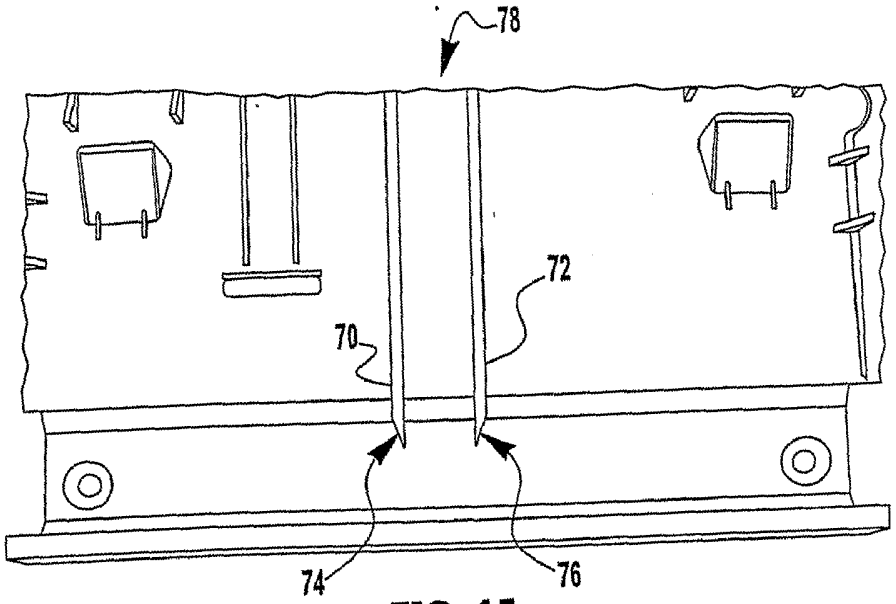



FIG. 14

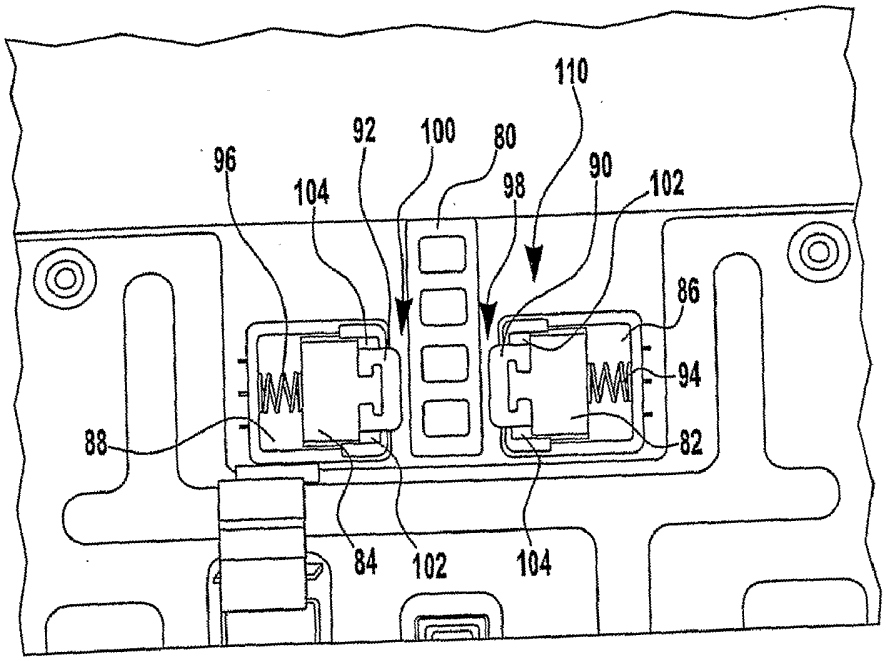



FIG. 15

# INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/025501

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60N2/46 A47C7/54

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B60N A47C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | GB 1 497 443 A (DAIMLER BENZ AG) 12 January 1978 (1978-01-12) the whole document | 1-12, 15-18 |
| A | DE 202 05 029 U (KUNSTSTOFFTECHNIK RIESSELMANN) 29 August 2002 (2002-08-29) page 4, line 1 - page 5, line 23; claims 1,8; figures 1,2 | 1,10 |
| A | EP 1 225 089 A (KUNSTSTOFFTECHNIK RIESSELMANN) 24 July 2002 (2002-07-24) paragraph '0006!; figures 2-5 | 1,10 |
| A | WO 02/102619 A (ROCKAFELLOW BRENT D ; WATJER SHELDON (US); HIPSHIER JASON M (US); JOHN) 27 December 2002 (2002-12-27) the whole document | 1,10 |

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 1 December 2004 | 21/12/2004 |

| Name and mailing address of the ISA | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31–70) 340–2040, Tx. 31 651 epo nl,<br>Fax: (+31–70) 340–3016 | Lotz, K-D |

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information on patent family members

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