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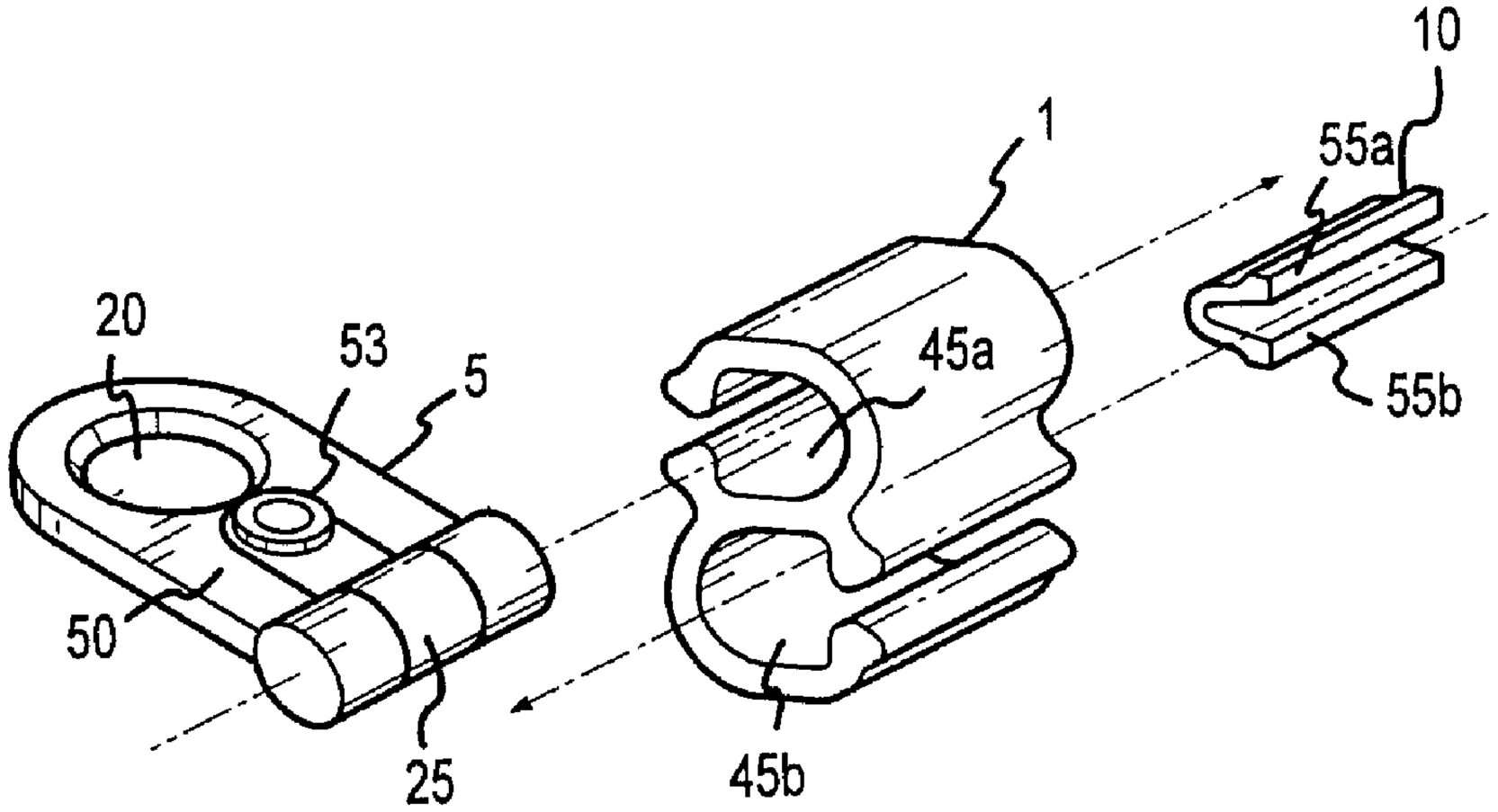
(71) Demandeur/Applicant:
MECHOSHADE SYSTEMS, INC., US

(72) Inventeurs/Inventors:
BERMAN, JOEL, US;
BROWN, VINCENT J., US;
ERLIKH, VICTOR, US

(74) Agent: GOWLING LAFLEUR HENDERSON LLP

(54) Titre : APPAREIL ET METHODE D'ASSEMBLAGE DE COMPOSANTS DE DISPOSITIF DE MONTAGE DE MATERIAU EN FEUILLES

(54) Title: APPARATUS AND METHOD FOR ASSEMBLING SHEET MATERIAL MOUNTING DEVICE COMPONENTS



(57) Abrégé/Abstract:
The present invention provides a sheet material mounting device having two channels, namely, a mounting channel for receivably engaging a rod for gripping the sheet material and a spacer channel for receivably engaging a spacer support configured to engage a lift cord and, optionally, a spacer cord. The spacer channel may be positioned above the mounting channel such that the center of gravity of the mounting device is located above the center of the mounting channel, thereby reducing asymmetric tilt of the sheet material engaged by the mounting channel and reducing friction against the lift cord. Alternatively, the mounting channel may be positioned above the spacer channel. The mounting channel and the spacer channel are preferably both C-shaped, and each channel has an opening which faces in a direction opposite the direction faced by the opening of the other channel. Thus, a side view of the mounting device may resemble either an "S" or a reverse "S". In accordance with another aspect of the invention, there is provided an apparatus and method for assembling the components of a sheet material mounting device, such that the assembled components of each sheet material mounting device are capable of maintaining vertical alignment with respect to every other sheet material mounting device comprised by the window covering system. Moreover, there is provided an apparatus and method for adjusting and re-aligning assembled components of a sheet material gripping apparatus.

ABSTRACT

The present invention provides a sheet material mounting device having two channels, namely, a mounting channel for receivably engaging a rod for gripping the sheet material and a spacer channel for receivably engaging a spacer support configured to engage a lift cord and, optionally, a spacer cord. The spacer channel may be positioned above the mounting channel such that the center of gravity of the mounting device is located above the center of the mounting channel, thereby reducing asymmetric tilt of the sheet material engaged by the mounting channel and reducing friction against the lift cord. Alternatively, the mounting channel may be positioned above the spacer channel. The mounting channel and the spacer channel are preferably both C-shaped, and each channel has an opening which faces in a direction opposite the direction faced by the opening of the other channel. Thus, a side view of the mounting device may resemble either an "S" or a reverse "S". In accordance with another aspect of the invention, there is provided an apparatus and method for assembling the components of a sheet material mounting device, such that the assembled components of each sheet material mounting device are capable of maintaining vertical alignment with respect to every other sheet material mounting device comprised by the window covering system. Moreover, there is provided an apparatus and method for adjusting and re-aligning assembled components of a sheet material gripping apparatus.

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APPARATUS AND METHOD FOR ASSEMBLING SHEET MATERIAL MOUNTING DEVICE COMPONENTS

Inventors: Joel Berman
Vincent J. Brown
Viktor Erlikh

Cross Reference to Related Application

The present application is a continuation-in-part of United States Patent Application No. 09/408,228, filed September 29, 1999.

Field of the Invention

The present invention relates generally to an apparatus and method for mounting sheet material to a support structure and, more particularly, to an apparatus and method for assembling the components of a window covering system, such as a Roman shade window covering system.

Background of the Invention

The prior art contains various devices for mounting, lifting, and folding flexible sheet material in association with blinds, curtains, draperies, and other window coverings. Some of these window shade devices include guide cables and lift cords in conjunction with a fabric-gripping device. These cables/cords are typically threaded through rings sewn to the shade fabric. Alternatively, the cables/cords are threaded through apertures in the fabric pleats, wherein the pleats may be formed or stiffened with slats. The lattice formed by the attachment of the shade fabric to these guide cables and lift cords constitutes a mobile support structure which allows the shade to travel between raised and lowered positions.

Roman shades are a particular type of window covering which incorporates a mobile support structure such as a lattice for gathering sheet fabric into substantially horizontal folds. One example of the construction of a contemporary Roman shade is a cloth fabric hanging from a head rail, with a lower end having weights at predetermined lateral intervals. This type of Roman shade can be raised by drawing up a lift cord such that large, loose folds in the fabric are formed at approximately equal vertical distances to provide a neatly pleated aesthetic appearance. A common configuration for connecting the cord to the shade is to sew at least two sets of rings or connectors in vertical lines along the back of the fabric material as shown in U.S. Pat. No. 1,321,800 entitled CURTAIN HANGER issued to

Andress, *et al.* on Nov. 18, 1919. In this type of Roman shade, a lift cord passes from a head rail through each set of rings and is then either fastened to the bottom edge of the fabric or wrapped around the bottom edge of the fabric and returned up the front face of the shade to the head rail. Alternatively, each set of rings or connectors is sewn to the sheet fabric and attached to a lift cord at predetermined vertical intervals. As the shade travels through raised positions, the interval between the connectors may be reduced.

However, due to the extensive time and labor to sew connectors to the back of the sheet material of a Roman shade, the art has developed other methods and devices to connect sheet fabric to a mobile support structure. In the shade system disclosed in U.S. Pat. No. 4,694,545 entitled ATTACHMENT OF RINGS WITHOUT SEWING issued to Dernis on Sep. 22, 1987, a set of U-shaped filaments are inserted through the fabric from the front face. The ends of each filament are gathered in a tube, bent over the end of the tube and held in place by a sleeve that fits over the tube.

Another alternative for attachment includes one or more horizontal ribs to provide support and to maintain spacing between the cords which are oriented vertically across the back of the fabric. For example, in U.S. Pat. No. 5,207,256 entitled SAFETY DEVICE FOR A RAISABLE CURTAIN DOOR issued to Kraeutler on May 4, 1993, the ribs are placed in vertically spaced, transverse pockets in the sheet material. However, in this system, the pockets must be sewn into the sheet material, thereby substantially adding to the time, effort, and expense of manufacture.

U.S. Pat. No. 5,273,096, entitled APPARATUS FOR GRIPPING SHEET FABRIC issued to Thomsen *et al.* on Dec. 28, 1993, discloses a tubular member having a longitudinal opening which receives the fabric and a rod, thereby gripping the fabric between the member and the rod. The backside of the tubular members each include loops through which the lift cords pass. However, as shown in **Figure 10**, if this system is used on a Roman shade for a large window, the combined weight of the tubular member and the rod will often cause tilting of the mounting device, thereby adding substantial friction to the lift cord and making it more difficult to raise the shade. More particularly, the fabric mounting device found in Thomsen *et al.* and other Roman shade systems employ designs wherein the center of gravity of the fabric mounting device causes the device to tilt asymmetrically as the shade is raised, distorting the fabric being held and thereby adding friction to the lift cord. Thus, the size of a Roman shade is often limited by the friction

incident upon the lift cord caused by the tilting of one or more of the rings, connectors, loops, or spacers used to mount the fabric to the lift cord.

A need exists for a light-weight, sheet-material gripping apparatus which can be quickly assembled by the manufacturer and which includes both light-weight and inexpensive spacers that can be connected to the sheet material without sewing. Moreover, the gripping apparatus components should reduce the lift cord friction which often increases asymmetric tilting of the sheet-material connectors as the apparatus is raised. Additionally, there is a need for an apparatus and method for easily and rapidly assembling tightly fitted components of a sheet material gripping apparatus such that, once assembled, the components of each sheet material gripping apparatus are capable of maintaining vertical alignment with respect to other sheet material gripping apparatus comprised by the window covering system. Moreover, there is a need for an apparatus and method for easily adjusting and re-aligning assembled components of a sheet material gripping apparatus.

Summary of the Invention

The present invention provides a sheet material mounting device having two channels, namely, a mounting channel for receivably engaging a rod for gripping the sheet material and a spacer channel for receivably engaging a spacer support configured to engage a lift cord and, optionally, a spacer cord. The spacer channel may be positioned above the mounting channel such that the center of gravity of the mounting device is located above the center of the mounting channel, thereby reducing asymmetric tilt of the sheet material engaged by the mounting channel and reducing friction against the lift cord. Alternatively, the mounting channel may be positioned above the spacer channel. The mounting channel and the spacer channel are preferably both C-shaped, and each channel has an opening which faces in a direction opposite the direction faced by the opening of the other channel. Thus, a side view of the mounting device may resemble either an "S" or a reverse "S". In accordance with another aspect of the invention, there is provided an apparatus and method for assembling the components of a sheet-material mounting device, such that the assembled components of each sheet material mounting device are capable of maintaining vertical alignment with respect to every other sheet material mounting device comprised by the window covering system. Moreover, there is provided an apparatus and method for adjusting and re-aligning assembled components of a sheet material gripping apparatus.

Brief Description of the Drawings

The features and advantages of the present invention reside in the details of construction and operation as more fully depicted, described, and claimed below, with particular reference to the accompanying drawings, wherein like numerals refer to like parts throughout, and wherein:

FIG. 1 is a three-quarter perspective view of an exemplary shade clamp according to one embodiment of the present invention;

FIG. 2A is a perspective view of an exemplary spacer according to one embodiment of the present invention;

FIG. 2B is a perspective view of an exemplary spacer with the lug portion removed according to one embodiment of the present invention;

FIG. 3 is a three-quarter perspective view of a portion of an exemplary rod according to one embodiment of the present invention;

FIG. 4 is a three-quarter perspective, exploded view of an exemplary sheet-material mounting apparatus depicting the positional relationship of the component parts according to one embodiment of the present invention;

FIG. 5 is a three-quarter perspective view with arrows depicting an exemplary method of receivably engaging a V-spring and spacer within opposed shade clamp channels according to one embodiment of the present invention;

FIG. 6 is a side elevation view of an exemplary shade clamp prepared to receive a welting of sheet material for subsequent gripping with a rod according to one embodiment of the present invention;

FIG. 7 is a side elevation view of an exemplary shade clamp having receivably engaged a V-spring and a welting of sheet material according to one embodiment of the present invention;

FIG. 8 is a side elevation view of an exemplary shade clamp attached to a support structure and having receivably engaged a V-spring, a welting of sheet material and a spacer, wherein the spacer includes a lift cord and spacer cord, according to one embodiment of the present invention;

FIG. 9 is a side elevation view of an exemplary shade clamp attached to a support structure and having receivably engaged a v-spring, a welting of fabric and a spacer, wherein the spacer includes a lift cord and spacer cord, according to an alternative embodiment of the present invention;

FIG. 10 is a side view of a prior art device showing the asymmetric tilting of the gripping devices;

FIG. 11A is a bottom view of a center support bracket according to one embodiment of the present invention;

FIG. 11B is a front view of a center support bracket according to one embodiment of the present invention;

FIG. 11C is a rear view of a center support bracket according to one embodiment of the present invention;

FIG. 12 is an exploded view of the housing assembly showing the end caps and wall brackets according to one embodiment of the present invention; and,

FIG. 13 is a side cut-away view of a support assembly showing a center support bracket, housing and shade clamp according to one embodiment of the present invention.

FIGS. 14A-E illustrate a side perspective view of an exemplary tool for assembling and aligning the components of a sheet material mounting device.

Detailed Description of Exemplary Embodiments

The following detailed description of exemplary embodiments of the present invention makes reference to the accompanying drawings, which form a part hereof and in which are shown, by way of illustration, exemplary embodiments in which the invention may be practiced. These exemplary embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it should be understood that other embodiments may be utilized and that logical and mechanical changes may be made without departing from the spirit and scope of the present invention. Thus, the following detailed description is presented for purposes of illustration only and not of limitation, and the scope of the present invention is defined solely by the appended claims.

The present invention preferably includes an apparatus and method for reducing a shade clamp's tilt and reducing the excess friction between a shade clamp (or channel guide) and a lift cord. One skilled in the art will appreciate that the shade clamp may be any device or combination of devices suitably configured to hold sheet material. For example, any clamp, clip, ring, fastener, mechanical device, electrical device, magnetic device, VELCRO™ device and/or the like. Moreover, the shade clamp is comprised of any suitable material which provides sufficient characteristics for holding the sheet material, such as, for

example, any type or combination of plastic, metal, rubber, wood, magnet, textile, glass and/or the like. Further, one skilled in the art will appreciate that the sheet material is any material capable of being held by shade clamp, such as, for example, any type or combination of cloth, textile, roman shade, pleated roman shade, wood, metal, animal skin, plastic, mesh, weave, and/or the like. In an exemplary embodiment, the sheet material is a piece of material in the form of a roman shade.

A suitable support structure is any structure capable of supporting the shade clamp and material, such as a headrail, cord, and/or spacers. With momentary reference to **Figure 13**, an exemplary shade system includes shade clamp **1** (only one shown), housing **90**, center bracket **71**, lift tube **112**, facie **110**, and other components of the system which will be described in more detail below. The present system may be used in conjunction with any shade operator device, such as a wrap spring shade operator as in "Wrap Spring Shade Operator" with inventors Joel Berman, Vincent J. Brown, Victor Erlikh and John Wilk filed on August 23, 1999 having U.S. Serial No. 09/379,065, the entire application is incorporated herein by reference.

Referring now to **Figure 1**, in accordance with one embodiment, a shade clamp **1** grips and mounts flexible sheet material **60** to a hanging support structure. The S-shaped shade clamp **1** is preferably rotationally symmetric about the central axis of clamp **1** and has opposed channels **45a, 45b**, wherein mounting channel **45b** reciprocally receives a welting of sheet material **60** and spacer channel **45a** receives a spacer support **5**, shown in **Figure 4**. The clamp **1** preferably includes interior retaining lips **35a, 35b** and peripheral retaining lips **40a, 40b** wherein an interior and peripheral retaining lip pair secures the welting of sheet material **60** or the spacer support **5** within opposed channels **45a, 45b** by restricting the exit path. Each interior lip **35** and peripheral lip **40** pair defines opposed lateral openings **30a, 30b** which provide access to opposed channels **45a, 45b**, respectively. The welting of sheet material **60** is releasably nested in the mounting channel **45b** with a positive pressure against the inside surface of the channel requiring no further tension or clamping. The interior lip **35b** and peripheral lip **40b** of the mounting channel lateral opening **30b** serve the dual purpose of preventing random release of the secured welting and providing for the neat pinching of the exterior sheet material so as to obscure the view of rod **10**, shown in Figure 3, within the mounting channel **45b**. In a preferred embodiment, the welting of sheet material **60** and the spacer support **5** are removably held within opposing channels **45a, 45b**

by interior lips **35a, 35b** and peripheral lips **40a, 40b**, respectively; however, those skilled in the art will also recognize various other means and methods that may be alternatively or conjunctively used within the scope of the present invention, such as any device or combination of devices suitably configured to restrict the exit path of material **60** or spacer support **5**. For example, a release pin, clasp, snaps, adhesive and/or the like.

As shown in **Figures 2A** and **2B**, spacer support **5** is configured for guiding the lift/guide cord **65**, optionally attaching to spacer cord **70**, and being receivably engaged by spacer channel **45a.** As best shown in **Figure 2A,** the spacer support **5** has an enlarged cylindrical end **25** which tapers down on its outside edge, thereby forming an arrowhead like configuration. Cylindrical end **25** is configured for nesting within spacer channel **45a** between the inside surface of spacer channel **45a**, the interior channel lip **35a** and the peripheral channel lip **40a**. Those skilled in the art will also recognize various other means and shapes that may be alternatively or conjunctively used which are considered as being within the scope of the present invention, such as any device or combination of devices suitably configured to engage the spacer channel **45a**. For example, a pin, rod, clasp, adhesive, and/or the like. Moreover, spacer support **5** can be integral with shade clamp **1** as a single-piece construction. Spacer support **5** itself can also be of single piece construction. In a preferred embodiment, spacer support **5** is clear rigid PVC material with UV protection; however, any suitable material such as plastic, metal, wood and/or the like is within the scope of the present invention.

With reference to **Figures 2A** and **4**, a planar flange **50** is attached to the longitudinal surface of cylindrical end **25**, such that flange **50**, when spacer support **5** is inserted into spacer channel **45a**, protrudes outwardly from the channel opening **30a**. In a preferred embodiment, spacer flange **50** includes an aperture **20** which receives lift cord **65** therethrough. The lift cord aperture **20** is positioned on the spacer flange **50** at a predetermined distance away from cylindrical end **25**. In a preferred embodiment, spacer support **5** is molded around spacer cord **70**, thereby providing a secure attachment between cord **70** and spacer support **5**. In a particularly preferred embodiment, spacer support **5** includes a cylindrical projection **53** which extends above and below spacer support **5**. In this embodiment, cylindrical projection **53** is also molded around spacer cord **70**, thereby increasing the support by spacer support **5** around spacer cord **70**. Cylindrical projection **53** may be any suitable material, may project above and/or below spacer support **5**, may be

molded as a single unit with spacer support **5**, may be a separate component (such as a dowel, washer, etc.), and may be located anywhere on spacer support **5**. One skilled in the art will appreciate that the present system can include more than one lift cord **65** or more than one spacer cord **70,** and aperture **20** can be of any size, located anywhere on spacer support **5**, additional apertures can exist on spacer support **5** or cords **65, 70** may be suitably attached, by clip, glue and/or the like, to any portion of the spacer support 5. Moreover, spacer support **5**, or any portion of spacer support **5**, may be formed around, and fused to, spacer cord **70** and/or lift cord **65**, thereby eliminating the need for the aperture **20**.

With particular reference to **Figure 2B**, spacer support **5** preferably includes an elliptical notch **54** on the cylindrical end **25** which receives a plate **52**. Notch **54** preferably includes a protruding, convex ridge along its inner circumference for receiving the side-slotted groove along the outer circumference of the side surface of plate **52**. Plate **52** is preferably an elliptical device with a first rounded end with a flat upper and lower surface and a second enlarged cylindrical end **25** which tapers down on its outside edge, thereby forming an arrowhead like configuration. In a preferred embodiment, if a spacer cord **70** is used, plate **52** and cylindrical projection 53 (as discussed above) is molded around spacer cord **70** such that spacer cord **70** travels through the flat upper and lower surface of plate **52.** One skilled in the art will appreciate that the plate **52** and notch **54** configuration can be any configuration and can include any suitable means for attaching plate **52** to spacer support **5** (groove, clip, etc.), or alternatively, spacer support **5** can be a one piece configuration without a removable plate **52**.

More particularly, if it is desired that sheet material **60** lay flat without pleating or the like (for example, in the case of sheet material **60** comprising a detailed pattern), plate **52** and spacer cord **70** may be eliminated from the system. However, if pleating or the like is desired (for example, in the case of sheet material **60** comprising a solid color), the incorporation of plate **52** and spacer cord **70** into spacer support **5** helps form the pleats.

Rod **10** is any device configured for securing sheet material **60** within the mounting channel **45b** of the shade clamp **1.** As best shown in **Figure 3** (which shows a portion of the elongated rod **10** in a V-spring clip embodiment), rod **10** is preferably one piece and has a length equal to the width of the shade. Alternatively, rod **10** is many clips, rods, or the like which are inserted into mounting channel **45b** at various locations. Rod **10** is preferably a V-spring having depressible wings **55a, 55b** for releasably securing a welting

of the sheet material **60**. As best shown in **Figure 6**, the V-spring wings **55a, 55b** are compressed to collapse the rod **10** for subsequent insertion into the mounting channel **45b** through the mounting channel lateral opening **30b**. After insertion into channel **45b**, the rod **10** is released and the wings **55a, 55b** expand to provide a force against the inner surface of channel **45b**, thereby sandwiching the sheet material **60** in mounting channel **45b** and restricting the movement of sheet material **60**. Those skilled in the art will also recognize various other means and shapes that may be alternatively or conjunctively used which are within the scope of the present invention, such as, for example, a rod, a pin, clasp, VELCRO™, adhesive, snaps and/or the like. Alternatively, rod **10** could be eliminated and material **60** can be wrapped around the outside of mounting channel **45b** and optionally clamped to the outside of mounting channel **45b** by any of the aforementioned clamping devices.

The positional arrangement of the component parts of the sheet material mounting apparatus is best shown in **Figure 4**. Spacer support **5** receivably engages through side insertion into spacer channel **45a** of shade clamp **1** and the rod **10** receivably engages through side insertion the mounting channel **45b** of the clamp **1**. An alternative method of receivably engaging both the spacer support **5** and the rod **10** in their respective channels **45a**, **45b** is shown by the arrows of **Figure 5** wherein the components are pushed into their respective channels through openings **30a, 30b**, respectively. Those skilled in the art will also recognize various other methods that may be alternatively or conjunctively used which are within the scope of the present invention, such as any arrangement or methods for receivably engaging, such as, for example, rotating the components into the channels, permanent single-piece construction and/or the like.

As is best shown in **Figure 6**, prior to receivably engaging a welting of sheet material **60**, the sheet material **60** is placed between the mounting channel **45b** and the rod **10**. As the upper wing **55a** and lower wing **55b** of the rod **10** are compressed, the rod **10** is pushed through the lateral opening **30b** of the mounting channel **45b** or slid through the side, forcing a welting of fabric **60** into the mounting channel **45b** as shown in **Figure 7**. Alternatively, a welting of sheet material **60** can be wrapped around the exterior surface of the rod **10** and then depressed and forced through the lateral opening **30b** (or slid through the side).

With the guide spacer channel **45a** opening the opposite direction to the sheet-material mounting channel **45b**, the receivably engaged spacer support **5** is positioned to bear a large percentage of the weight of the sheet material **60** at a point approximately directly above the point of sheet material attachment within channel **45b**. This configuration positions the center of gravity of the apparatus more directly above the mounting channel **45b** which has the effect of reducing asymmetric tilting of the sheet-material mounting apparatus as the lift cord **70** is raised. This in turn reduces the friction incident upon the lift cord **70** as the shade travels through raised positions and reduces the pulling force needed to lift the shade.

One method of attachment of clamp **1** to the support structure of a lift cord **65** and spacer cord **70** is shown in **Figure 8**. As the lift cord **65** is raised, the spacer support **5** is engaged at a predetermined point to raise and travel with the lift cord **65**. The spacer cord **70** is a static line that provides a guide for a plurality of spacer supports **5** to travel along as the shade is moved through raised positions. The spacer cord **70** also assists with preventing torquing of the spacer supports **5** as the lift cord **65** is raised.

Figure **9** shows an alternative configuration for reducing friction incident upon the lift cord **70**. In this alternative embodiment of the present invention, the receivably engaged spacer support **5** is positioned to bear the weight of the sheet material **60** at a point directly below the point of sheet material attachment to mounting channel **45b**. This configuration positions the center of gravity of the apparatus more directly below the mounting channel **45b** which similarly has the effect of reducing asymmetric tilting of the sheet-material mounting apparatus as the lift cord **65** is raised. The alternative embodiment of the present invention depicted in **Figure 9** reduces the friction incident upon the lift cord **65** as the shade travels through raised positions as well.

With respect to **Figures 11A-C**, various views of a center support bracket **71** is shown. Center support bracket **71** is any suitable device configured to support the lift tube **112** (shown in **Figure 13**), housing **90**, facie **110** (shown in **Figure 13**), spacer support **5**, and fabric mount while providing a guide for the lift cords **65**. One skilled in the art will appreciate that bracket **71** is of any configuration and comprised of any suitable material. Moreover, bracket **71** can be one molded multi-functional component or can be a plurality of components which perform one or more of the aforementioned functions. In a preferred embodiment, bracket **71** includes a central circular opening **76** for supporting the lift tube

112. Top and rear rectangular plates **78** are attached to opening **76** by a lattice structure which is perpendicular to the surface of opening **76**. Rectangular plates **78** include lips around its periphery such that plates **78** are suitably configured to attach bracket **71** to housing **90** by slidably engaging the lips into channels **94.** The front of bracket **71**, as best seen in **Figure 11B**, preferably includes a rectangular facie plate **80** with a lip on its periphery for slidably engaging facie. One skilled in the art will appreciate that plates **78** and **80** can attach to other parts by any suitable means, including for example, snaps, VELCRO™, adhesives and/or the like, or can be integral with the other components. Below plate **80**, towards the bottom of bracket **71**, is an angled ledge **82** which is configured to support the fabric mounting spline. As best seen in **Figure 11A**, below ledge **82**, and on the bottom of bracket **71**, are two opposing notches **72** which open to the outside surfaces of bracket **71** and a circular slot **73**. Notches **72** and slot **73** are suitably configured to retain spacer support **5.** Also, on the bottom of bracket **71** and further towards the rear surface, there are preferably four apertures **74** which are suitably configured to guide the lift cord **65**, wherein two of the holes on the same side are for two different cords depending on the left or right configuration of the cords.

With respect to **Figure 12**, an exemplary housing assembly **90** is shown. Housing assembly **90** is any suitable device or combination of devices in any suitable configuration for supporting center bracket **71** and facie **110** and comprised of any suitable material such as plastic, PVC, metal, aluminum, wood, and/or the like. In a preferred embodiment, housing **90** includes L-shaped plate **92** comprised of extruded aluminum, end caps **96** comprised of plastic, and wall brackets **104** comprised of metal. Plate **92** includes various channels **94** for slidably engaging plates **78** and **80** of center bracket **71**, wall bracket **104,** and plates **98** of end caps **96**. End caps **96** preferably include plates **98** for slidably engaging plate **92** and pins **100** for attaching to the shade drive end bracket.

In accordance with another exemplary aspect of the present invention, **Figures 14A-E** illustrate an exemplary insertion tool **200**. Insertion tool **200** may be used for assembling components of a sheet material mounting device, such as shade clamp **201** and spacer support **205**. However, it will be appreciated that insertion tool **200** may be used in any of several contexts. For example, insertion tool **200** may be used to insert or assemble hardware components within an opening in a wall or similar structure. Insertion tool **200** may also be configured for use with components used in microdevices, such as integrated

circuits. Referring now to **Figure 14A**, in accordance with one exemplary embodiment, tool **200** comprises a base member **202** having a working end **204** and a handle end **206**. One skilled in the art will appreciate that tool **200** may be comprised of any suitable material or combinations of materials, such as, for example, plastic, metal, wood, concrete, rock, and/or the like. In an exemplary embodiment, tool **200** is molded of Delrin. Moreover, tool **200** may be comprised of a single molded, shaped, or formed unit, or it may comprise any number of pieces permanently or releasably attached to each other.

In accordance with one aspect of the invention, handle end **206** is configured to be gripped by the hand of a person, though other embodiments of handle **206** may permit use of tool **200** by a machine or automated device. In one embodiment, handle end **206** permits insertion of a hand through an open center portion **208** and around handle portion **210**. Handle portion **210** may comprise any suitable surface contour or configuration, such as rounded or bulbous, cylindrical, rectangular, conical, and/or the like. In another embodiment, center portion **208** is a solid portion which permits handle end **206** to be grasped in the palm of the hand. For example, in this embodiment, handle portion **210** may be held by being pressed against the palm of the hand while the fingers of the hand grasp one side of center portion **208** and the thumb grasps an opposite side of center portion **208**. Handle end **206** may be of any suitable dimension or size. In one embodiment, handle end **206** is thicker than working end **204** to suitably accommodate the grip or grasp of a human hand, a machine, or an automated device.

Working end **204** is distal from the handle end **206** and is configured to receivably engage and releasably retain a part or component, such as spacer support **205**, such that working end **204** and the component are then capable of being inserted into and receivably engaged by an opening, such as spacer channel **245a** for example. As described herein, the insertion of a component into a spacer channel illustrates an exemplary use for and method of using tool **200** in accordance with the present invention. However, tool **200** may be used to insert and adjust or align parts or components in conjunction with other types of openings, channels, or holes having a variety of shapes or configurations, such as circular, rectangular, square, oblong, triangular, etc., and still fall within the scope of the present invention. In one embodiment, working end **204** includes a pair of spaced apart protruding members **212** which are each configured to be inserted into or slid through the spacer channel **245a** of shade clamp **201**, as best illustrated in **Figure 14D**. The protruding

members **212** extend outwardly from the working end **204** of base member **202** and may be of any suitable shape or configuration, such as rectangular, cylindrical, conical, square, and/or the like.

In one embodiment, protruding members **212** are substantially rectangular. In this embodiment, the protruding members **212** each comprise an outer edge **214**, an inner edge **215**, an upper surface **216**, a lower surface (not shown), an inner side surface **218**, and an outer side surface **219**. In one embodiment, outer edge **214** has a rounded surface. In another embodiment, upper surface **216** is gradually sloped upward relative to a level lower surface, such that thickness **T** of protruding member **212** gradually increases along the width of protruding member **212** between outer edge **214** and inner edge **215**. In one embodiment, upper surface **216** is gradually sloped upward at an angle ranging from about 2 degrees to about 15 degrees relative to the lower surface and the longitudinal axis of the base member **202**. Preferably, upper surface **216** is sloped upward at an angle of from about 3 degrees to about 7 degrees and, more preferably, from about 3 degrees to about 4 degrees. In another embodiment, the lower surface (not shown) of the protruding member **212** is gradually sloped downward relative to a level upper surface **216**, such that thickness **T** of protruding member **212** gradually increases along the width of protruding member **212** between outer edge **214** and inner edge **215**. In this embodiment, the lower surface is gradually sloped at an angle ranging from about 2 degrees to about 15 degrees relative to the upper surface **216** and the longitudinal axis of the base member **202**. Preferably, the lower surface is sloped at an angle of from about 3 degrees to about 7 degrees and, more preferably, from about 3 degrees to about 4 degrees. In yet another embodiment, both the upper surface **216** and the lower surface of protruding member **212** are gradually sloped away from each other and relative to the longitudinal axis of the base member **202** such that each protruding member **212** has a substantially conical configuration.

In an exemplary embodiment, protruding members **212** are spaced apart by a recess **222** in the working end **204** of base member **202**. Recess **222** may be of any suitable shape or configuration, such as square, rectangular, semi-circular, and/or the like. In one embodiment, recess **222** is defined by a rear surface **224** and a pair of opposing side surfaces **226** in the working end **204**. In an exemplary embodiment, opposing side surfaces **226** each include means for engaging and retaining a spacer support **205**, which means may include a plurality of retaining members adapted to support the spacer support **205** within

recess **222**, a suitably dimensioned channel or track which may be inset into each of the opposing side surfaces **222** and into which the spacer support **205** may be inserted, or the like. In an alternate embodiment, rear surface **224** may also include suitable means for releasably retaining spacer support **205**, such as retaining members or a suitably dimensioned inset channel or track. Recess **222** and the means for engaging and retaining spacer support **205** are suitably adapted to releasably engage the spacer support **205**.

In one embodiment, the means for engaging and retaining a spacer support **205** comprise a plurality of retaining members **228** extending from each of the opposing side surfaces **226**. The retaining members **228** may be arranged in any suitable configuration capable of receivably engaging and retaining the spacer support **205** within recess **222**. As illustrated in **Figure 14B**, retaining members **228** may be arranged in a V-shaped configuration such that a pair of spaced apart upper retaining members **228a** are coupled with a lower retaining member **228b** which is placed beneath the space **230** that separates the pair of upper retaining members **228a**. A space or track having height **H2** is created between upper retaining members **228a** and lower retaining member **228b**. Height **H2** is slightly greater than the thickness **H1** of spacer support **205**. In this manner, the spaces or tracks created by the opposing side surfaces **226** may stabilize and retain the spacer support **205** within the recess **222**, such that when spacer support **205** is inserted within the recess **222**, an upper portion, such as that provided by the retaining members **228a**, exerts a downward force on spacer support **205** while a lower portion, such as provided by retaining member **228b**, exerts an upward force on spacer support **205**. Alternatively, retaining members **228** may be arranged such that a pair of spaced apart upper retaining members are coupled with a spaced apart pair of lower retaining members. In a further embodiment, retaining members **228** may be adapted such that a single upper retaining member on each of the opposing sides **226** is coupled with a single lower retaining member on each of the opposing sides **226** to suitably engage and retain spacer support **205** within recess **222**. Recess **222** and retaining members **228** are suitably dimensioned to permit spacer support **205** to be slidably inserted within and removed from the recess **222**. In one embodiment, recess **222** has a width **W2** that is slightly greater than a width **W1** of spacer support **205** and a length **L2** that is substantially similar to a length **L1** of spacer support **205**. One skilled in the art will appreciate that retaining members **228** illustrate an exemplary means for engaging and retaining a spacer support **205** within recess **222** in accordance with the present invention and that other structures, such as an inset track or channel within each of

opposing side surfaces **226**, which perform similar functions may be employed and still fall within the scope of the present invention.

As seen in **Figure 14C**, spacer support **205** may be inserted within recess **222** such that planar flange **250** is supported by retaining members **228** and cylindrical end **225** occupies the space between the protruding members **212**. In one embodiment, the outer edge **227** of cylindrical end **225** is substantially flush with the outer edges **214** of protruding members **212**. Spacer support **205** may be inserted into the tool **200** either with or without a spacer cord (not shown) being inserted through cylindrical projection **253** and/or a lift cord (not shown) being inserted through lift cord aperture **220**.

Referring next to **Figure 14D**, tool **200**, with spacer support **205** retained within recess **222**, can be used to insert spacer support **205** within spacer channel **245a** of shade clamp **201**. In one embodiment, one of the protruding members **212** of the working end **204** of tool **200** is brought into contact with a spacer channel end **247** and is inserted or slid into spacer channel **245a** between peripheral lip **240a** and inner lip **235a**. In this embodiment, the protruding member **212** may be used to open or slightly pry apart the lips **240a** and **235a** at one end **247** of the spacer channel **245a**, such that a first protruding member **212** slides into the spacer channel **245a**, followed by spacer support **205** and then a second protruding member **212**.

Alternatively, the working end **204** of tool **200** with spacer support **205** retained within recess **222** may be brought into contact with the spacer channel **245a** such that the protruding members **212** and the spacer support **205** exert a perpendicular force in the direction of arrow **232** against lips **240a** and **235a**. As one skilled in the art will appreciate, in the context of using tool **200** with other types of openings and other types of parts or components, the working end **204** of tool **200** may be brought into contact with the outer edges of the opening, such that the protruding members **212** and the component exert a perpendicular force against the outer edges of the opening to enable the tool **200** and the component to be inserted into the opening. The tool **200** may be inserted into an opening with or without the aid of an additional tool, such as a hammer or mallet for example (not shown). In the embodiment depicted in **Figure 14D**, the working end **204** of the tool **200** may be used to insert the spacer support **205** substantially at the desired location or position within the spacer channel **245a**. That is, protruding members **212** are used substantially simultaneously to open or pry apart lips **240a** and **235a** at a selected location along spacer

channel **245a** to permit the insertion of the protruding members **212** and spacer support **205** into the spacer channel **245a**. However, in either of these embodiments, once inserted within the spacer channel **245a**, tool **200** permits the spacer support **205** to be suitably moved or selectively positioned within spacer channel **245a**. Thus, tool **200** may be used to selectively position spacer support **205** within the spacer channel **245a** during the insertion step or, alternatively, the tool **200** may be used to selectively position spacer support **205** anywhere along the length of spacer channel **245a** subsequent to the insertion step. Moreover, tool **200** may be used consecutively to similarly insert and position multiple spacer supports **205** within spacer channel **245a**.

Once spacer support **205** has been suitably positioned within spacer channel **245a**, the tool **200** may be suitably removed from the spacer channel **245a**. In one embodiment, tool **200** is removed by the exertion of a force on tool **200** that is perpendicular to and away from the spacer channel **245a**. In this manner, the tool **200** is pulled directly out of and away from the spacer channel **245a** in the direction of arrow **234** of **Figure 14E**. As further illustrated in **Figure 14E**, since recess **222** and retaining members **228** are adapted to releasably engage spacer support **205**, spacer support **205** remains suitably positioned within spacer channel **245a** when tool **200** is removed from the spacer channel **245a**.

Once a part or component has been inserted into the appropriate opening, such as spacer channel **245a**, the component may require adjustment or re-alignment with respect to other components of the window covering system. The tool **200** also may be used to adjust or re-align these already-assembled components. The tool **200** provides leverage and a gripping surface to assist in shifting the arrangement of assembled components. To accomplish this, the tool **200** is extended into the opening and brought into contact with the component such that the component is retained by the working end **204** and capable of being moved by the tool **200** to an alternate position within the channel or opening without being bound by the opening. In this manner, the tool **200** permits adjustment and re-alignment of tightly fitting assembled components.

While the invention has been particularly shown and described above with reference to exemplary embodiments, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and the scope of the present invention and that the invention encompasses all such modifications. No single

feature, function, or property of any disclosed embodiment is required for the practice of the present invention unless specifically described herein as "essential" or "critical".

What is claimed is:

1. A device comprising:

a base member including a handle end and a working end distal from said handle end;

wherein said working end comprises:

a recess defined by a rear surface and opposing side surfaces which are configured to receive and releasably retain a component; and

a pair of protruding members extending outwardly from said working end and spaced apart by said recess.

2. The device of claim 1, wherein said handle end is configured to be gripped by at least one of a human hand, a machine, and an automated device.

3. The device of claim 2, wherein said base member further comprises one of an open center portion and a solid center portion.

4. The device of claim 1, wherein at least one of an upper surface of each of said protruding members and a lower surface of each of said protruding members has an increasing slope relative to a longitudinal axis of said base member.

5. The device of claim 1, wherein at least one of said rear surface and said opposing side surfaces comprises a track configured to slidably receive and releasably retain the component within said recess.

6. The device of claim 1, wherein each of said opposing side surfaces comprises a plurality of retaining members, each of which extends from said opposing side surfaces and into said recess and is configured to receive and releasably retain the component.

7. The device of claim 6, wherein said plurality of retaining members is arranged in a V-shaped configuration.

8. The device of claim 1, further comprising a component releasably retained within said recess and between said protruding members.

9. The device of claim 8, wherein said component comprises a spacer support.

10. The device of claim 9, wherein an outer edge of said spacer support is substantially flush with each outer edge of said protruding members.

11. A method of inserting a component into an opening, the method comprising:

providing an insertion tool including a handle end and a working end;

inserting a spacer support within a recess in said working end of said insertion tool;

contacting an opening with said insertion tool and said spacer support;

inserting said spacer support and said insertion tool within said opening;

removing said insertion tool from said opening while leaving said spacer support within said opening.

12. The method of claim 11, wherein the step of contacting said opening further comprises using said insertion tool to exert a perpendicular force against outer edges of said opening.

13. The method of claim 12, wherein the step of contacting further comprises selectively positioning said spacer support relative to said opening.

14. The method of claim 12, wherein the step of inserting said spacer support further comprises prying apart said outer edges with protruding members of said insertion tool and inserting said spacer support and said protruding members through said outer edges and into said opening.

15. The method of claim 14, further comprising positioning said spacer support within said opening after inserting said spacer support and said protruding members within said opening.

16. The method of claim 14, wherein the step of removing further comprises applying to said insertion tool a perpendicular force away from said opening such that said insertion tool is pulled out of said opening.

17. The method of claim 12, wherein said opening comprises a spacer channel and said outer edges comprise lips.

18. The method of claim 17, wherein the step of contacting a spacer channel further comprises contacting a spacer channel end with a first end of said working end of said insertion tool, and wherein the step of inserting said spacer support further comprises sliding said first end, said spacer support, and a second end of said working end of said insertion tool into said spacer channel from said spacer channel end.

19. The method of claim 17, further comprising selectively positioning said spacer support within said spacer channel after inserting said spacer support and said insertion tool within said spacer channel.

20. The method of claim 18, wherein the step of removing further comprises applying to said insertion tool a perpendicular force away from said spacer channel such that said insertion tool is pulled out of said spacer channel.

21. A method of adjusting and re-aligning a component within an opening, the method comprising:

providing an insertion tool including a handle end and a working end;

contacting an opening and a component retained within said opening with said working end of said insertion tool;

engaging said component with said working end; and

moving said component to an alternate location within said opening.

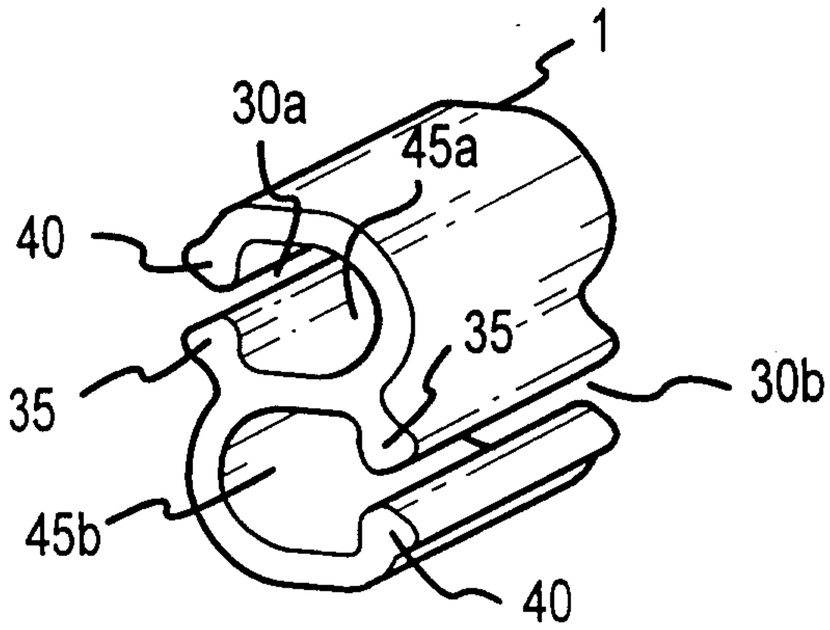


FIG.1

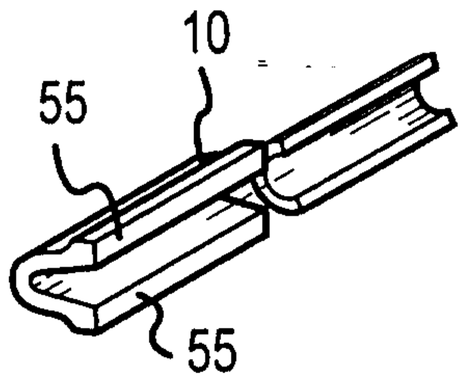


FIG.3

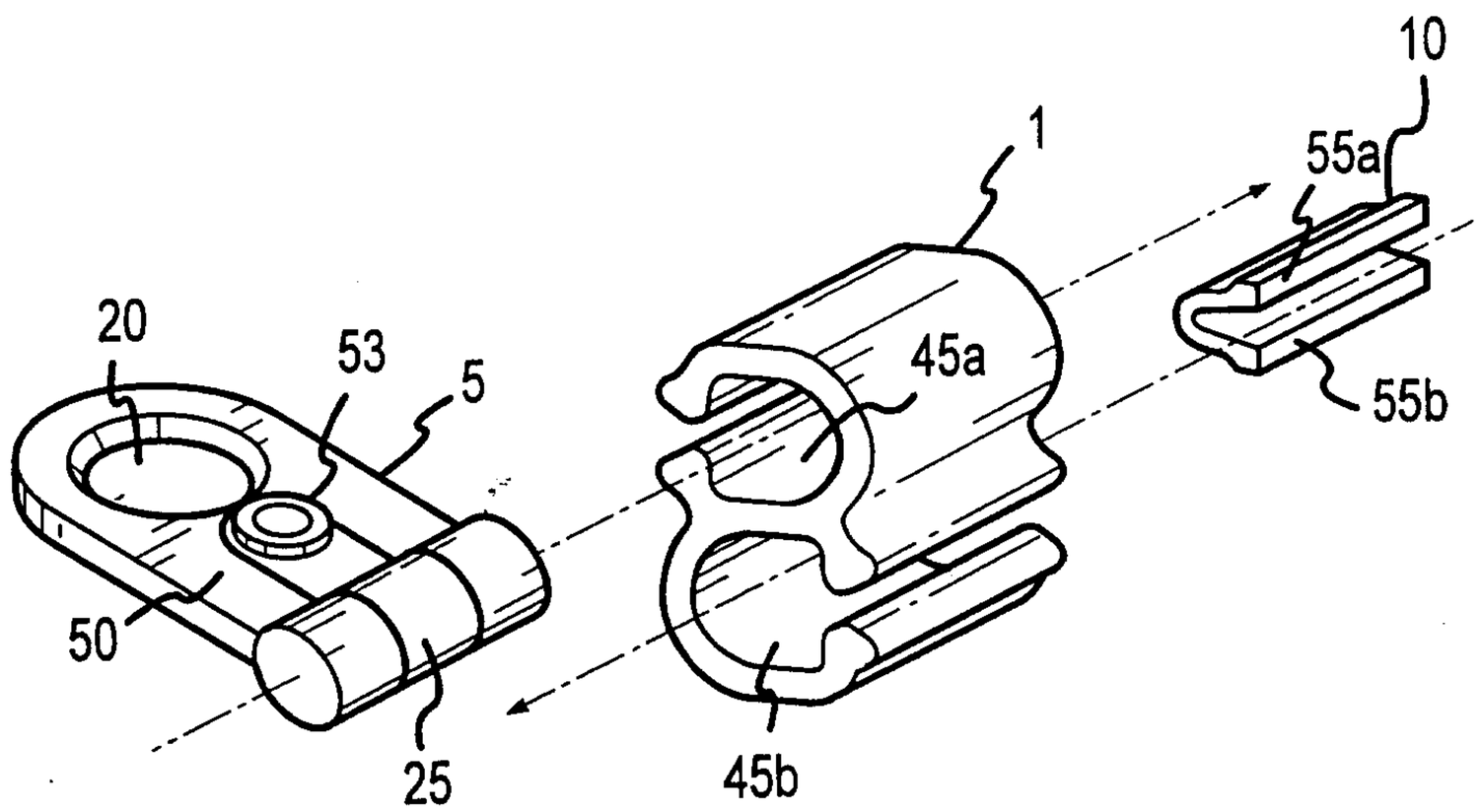


FIG.4

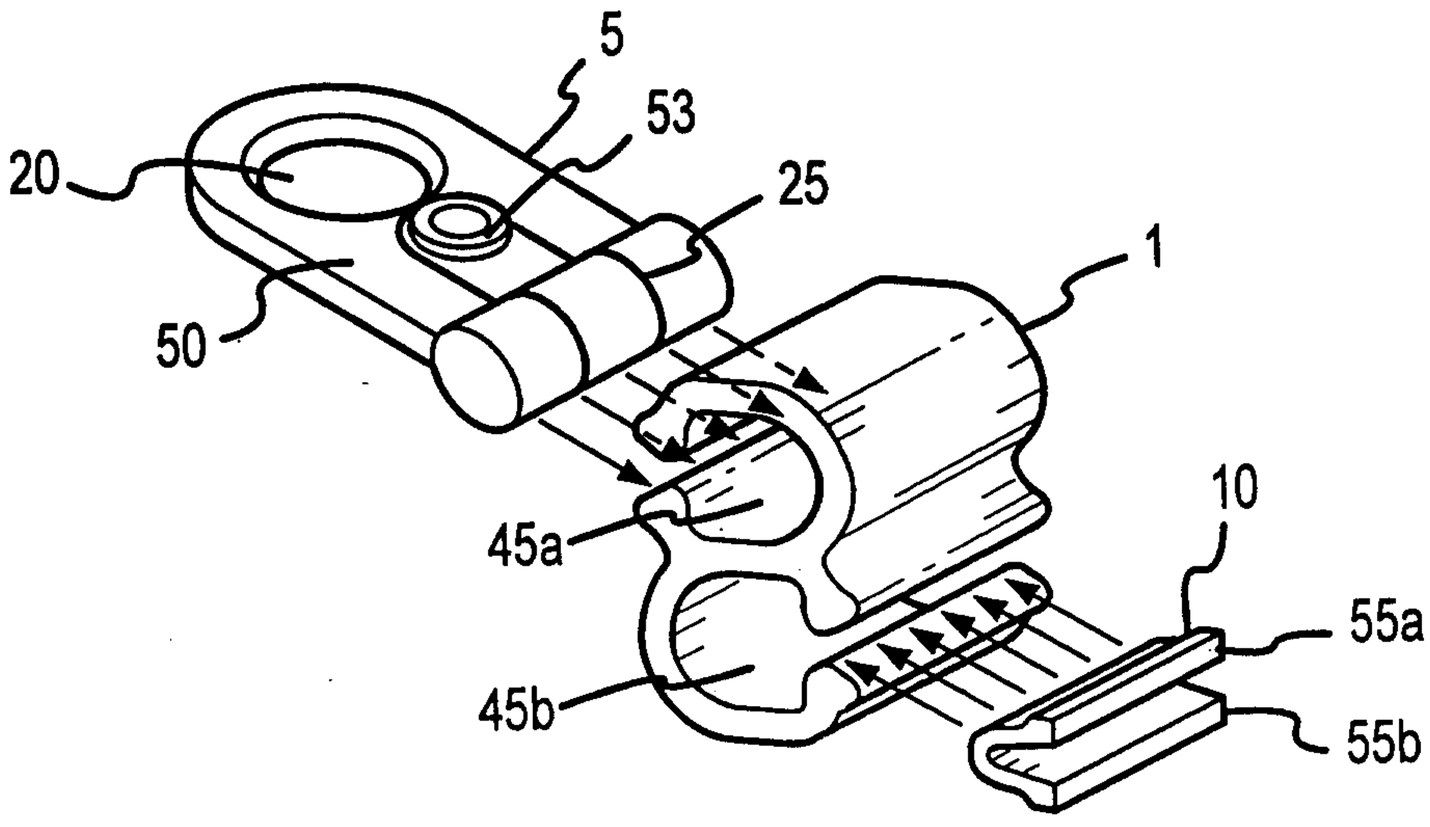


FIG.5

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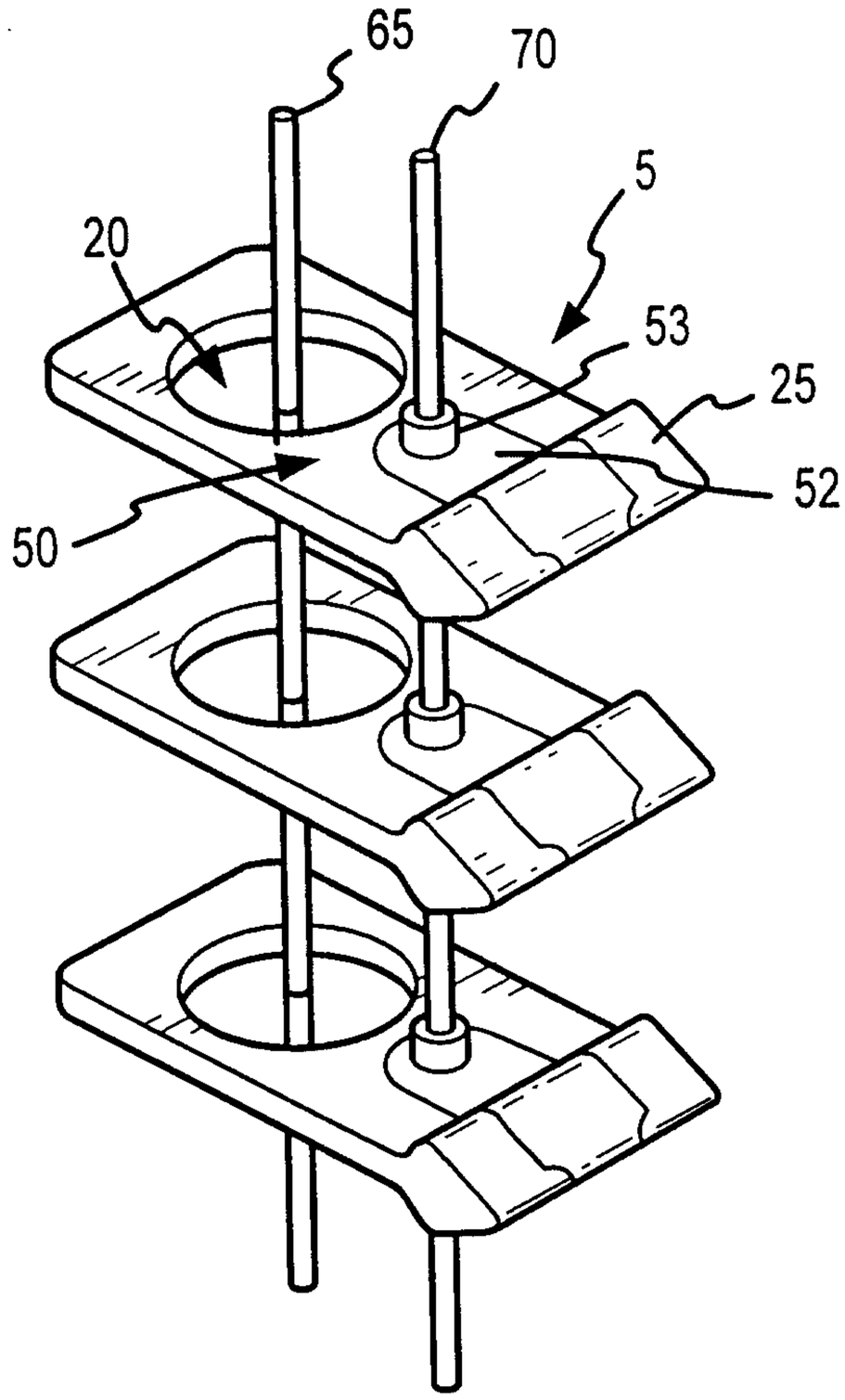


FIG.2A

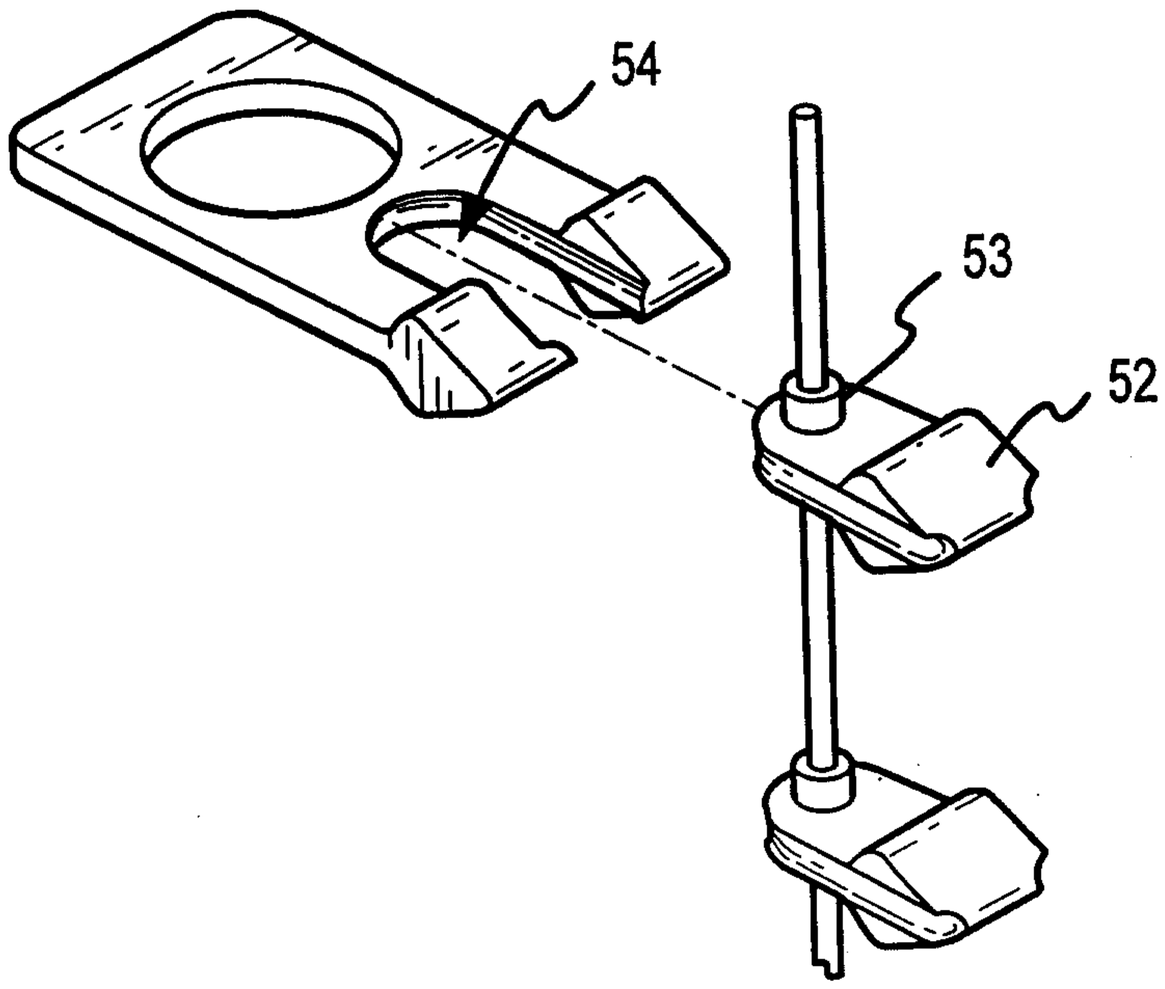


FIG.2B

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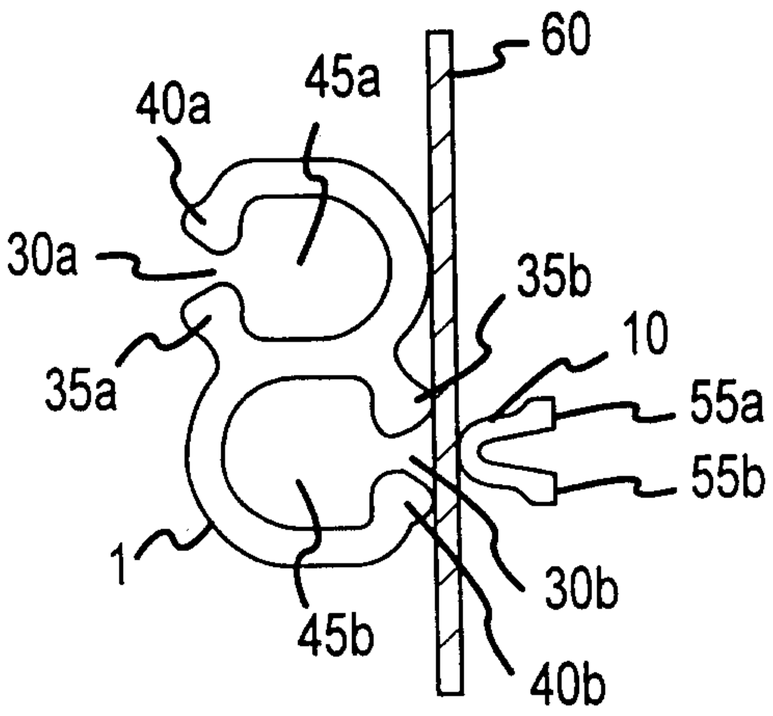


FIG.6

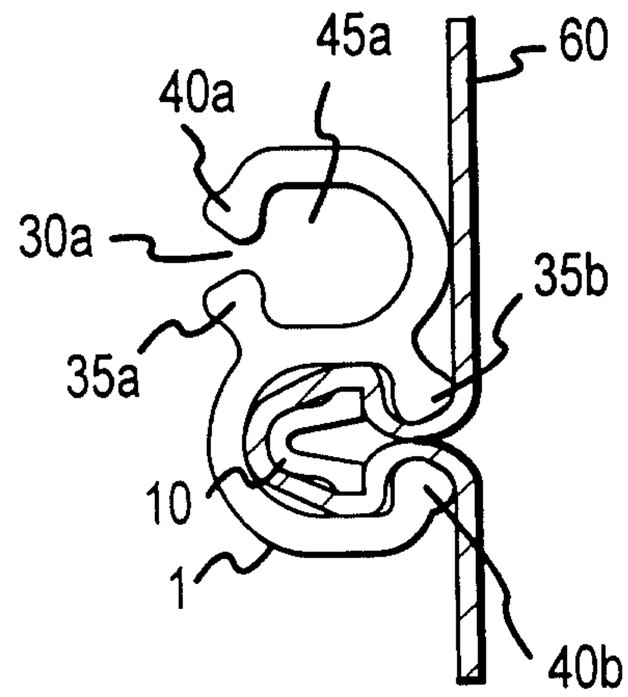


FIG.7

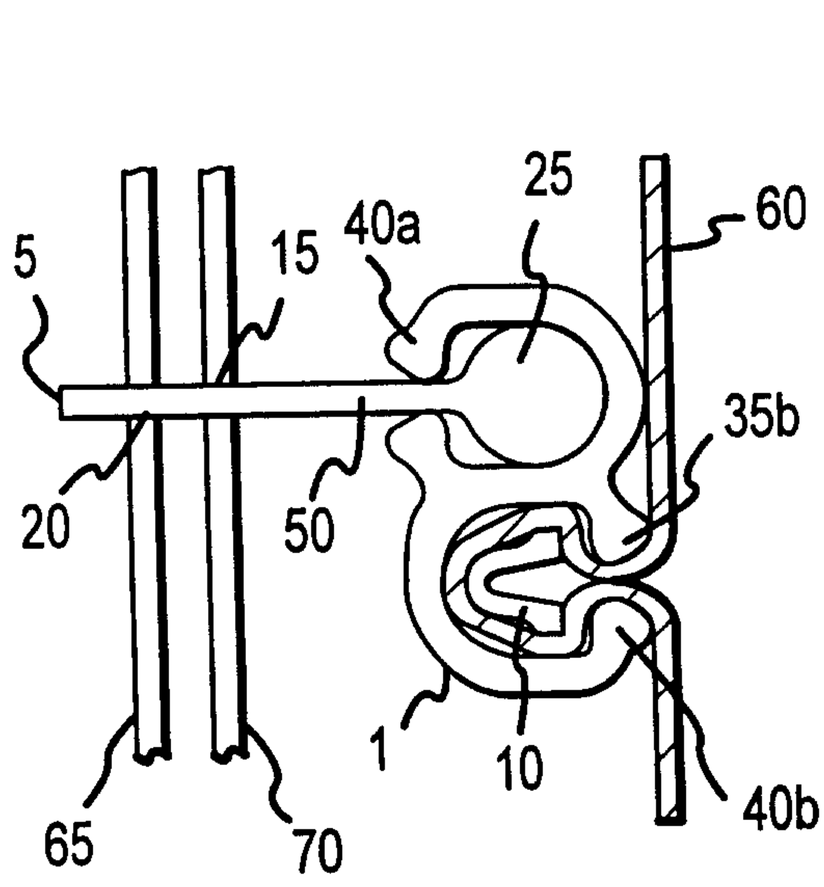


FIG.8

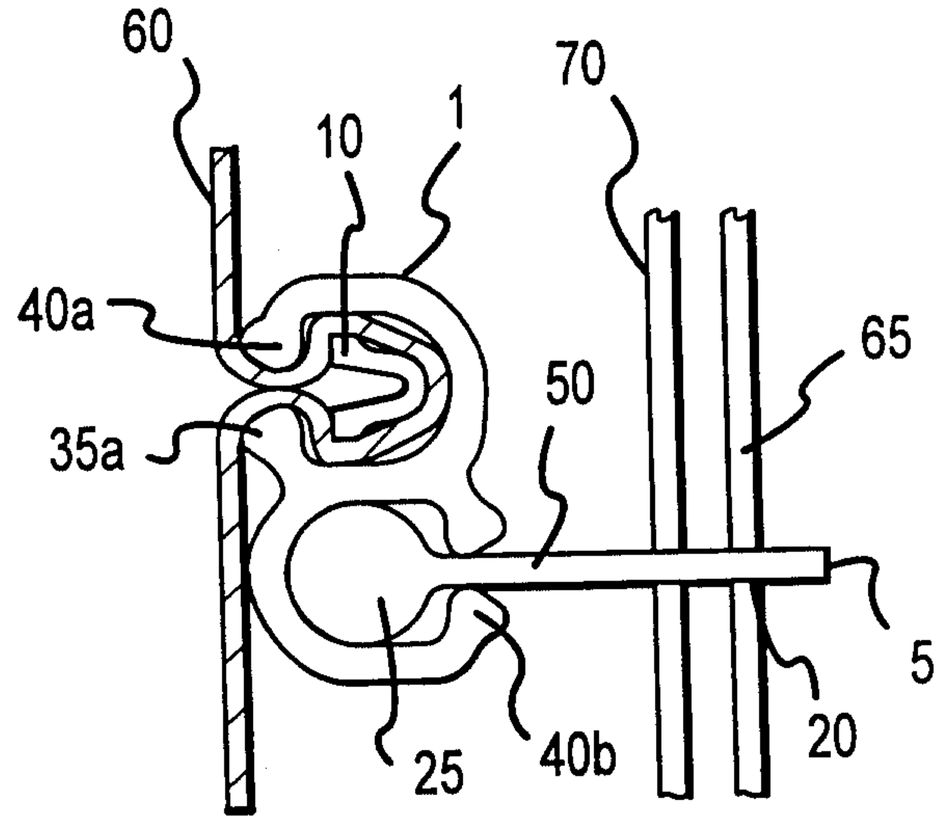


FIG.9



PRIOR ART

FIG.10

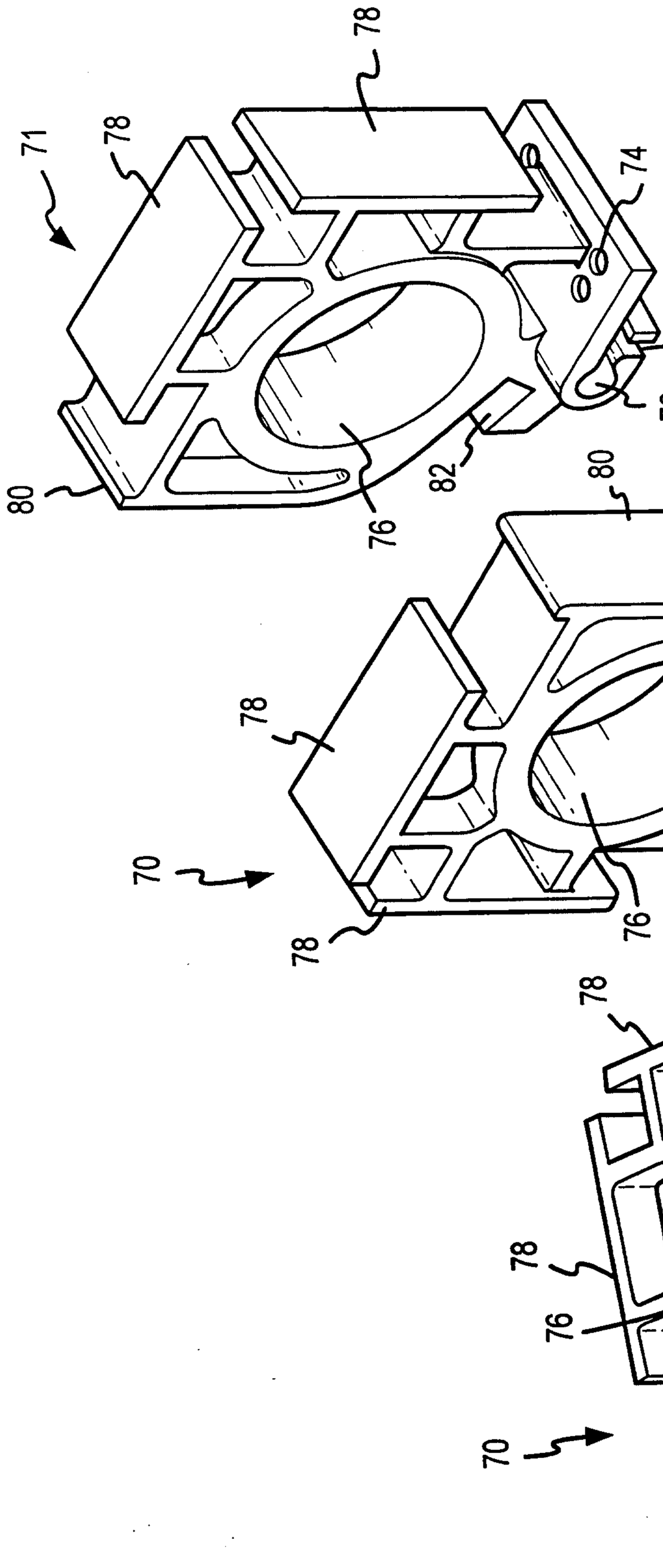


FIG.11C

FIG.11B

FIG.11A

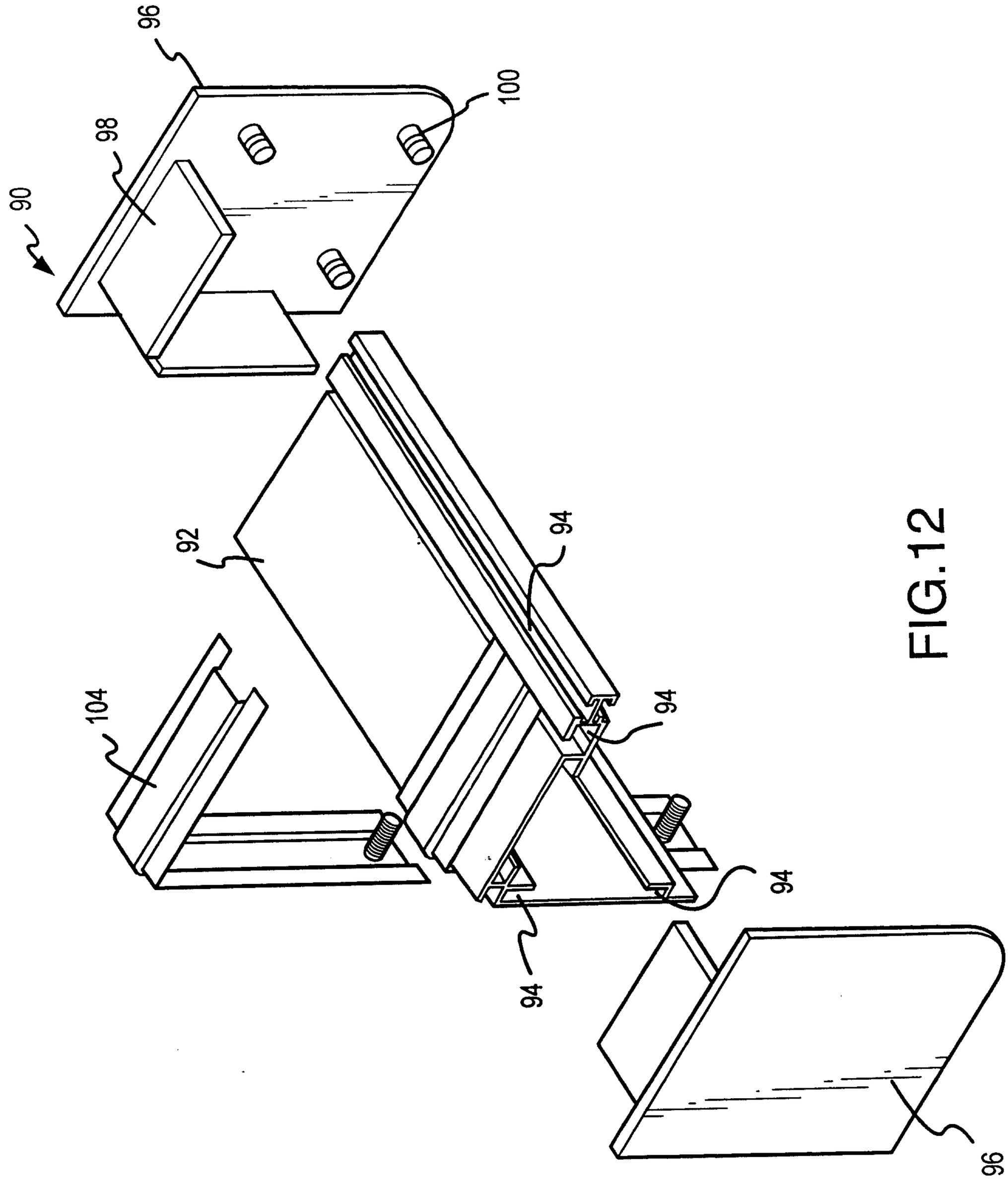


FIG.12

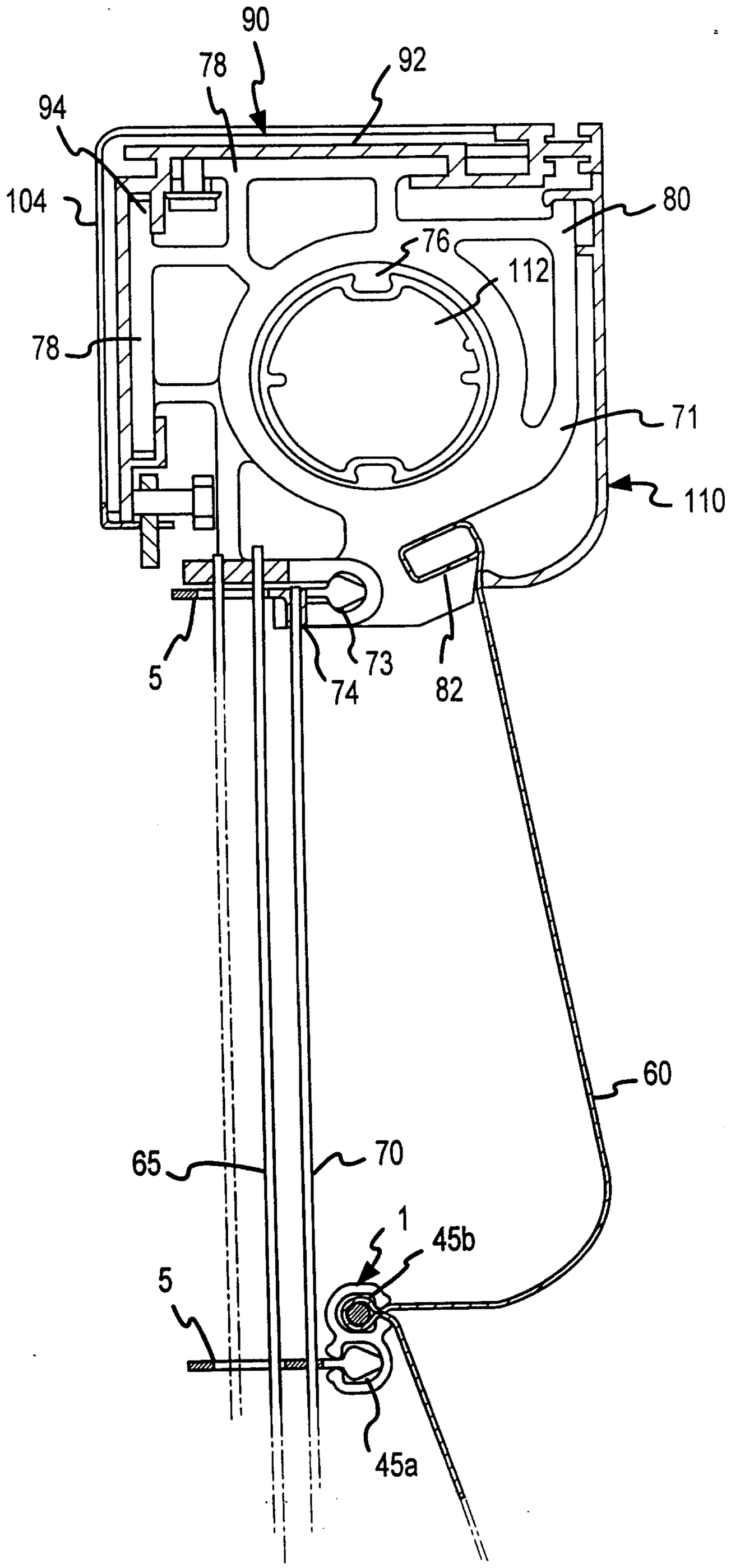


FIG.13

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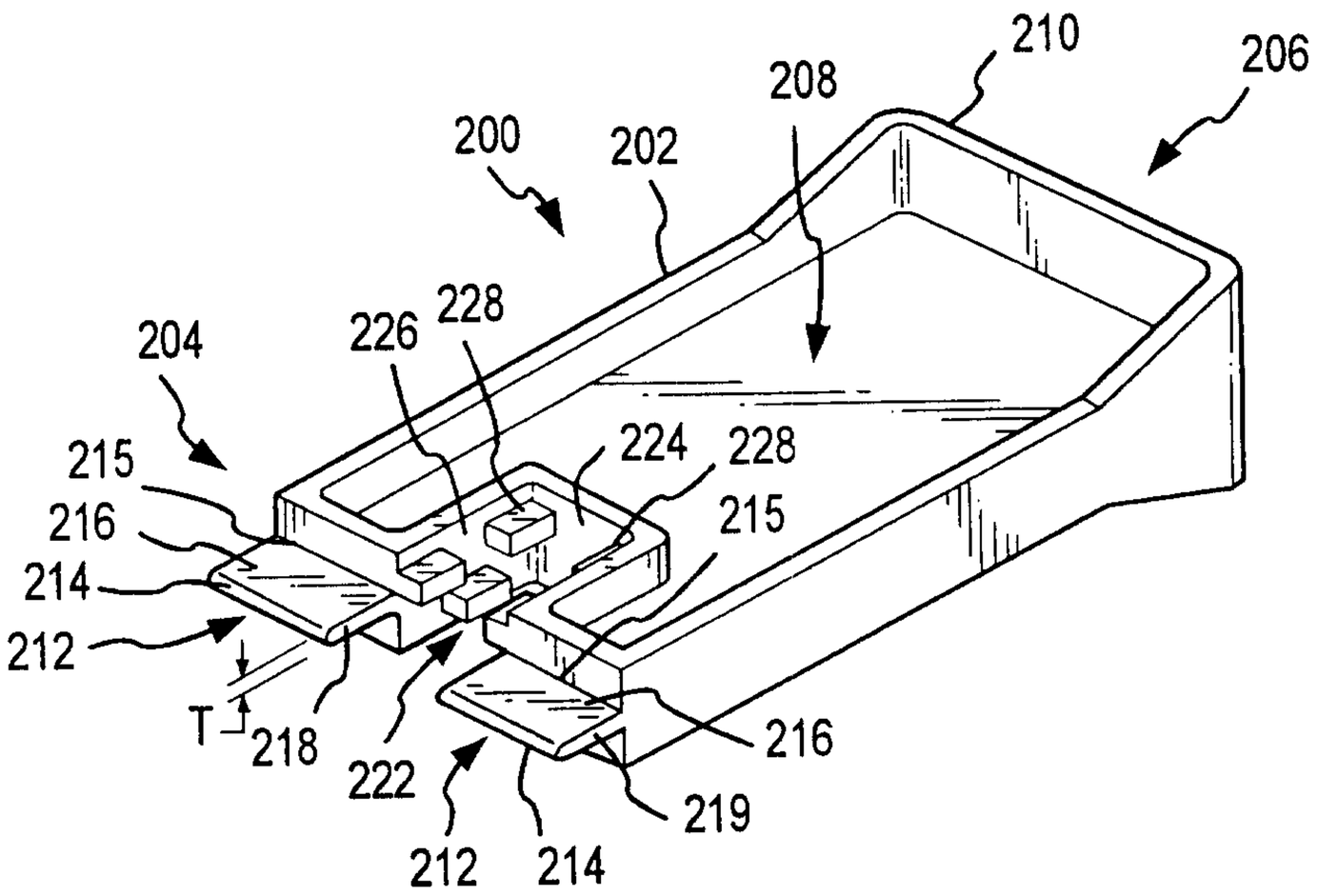


FIG.14A

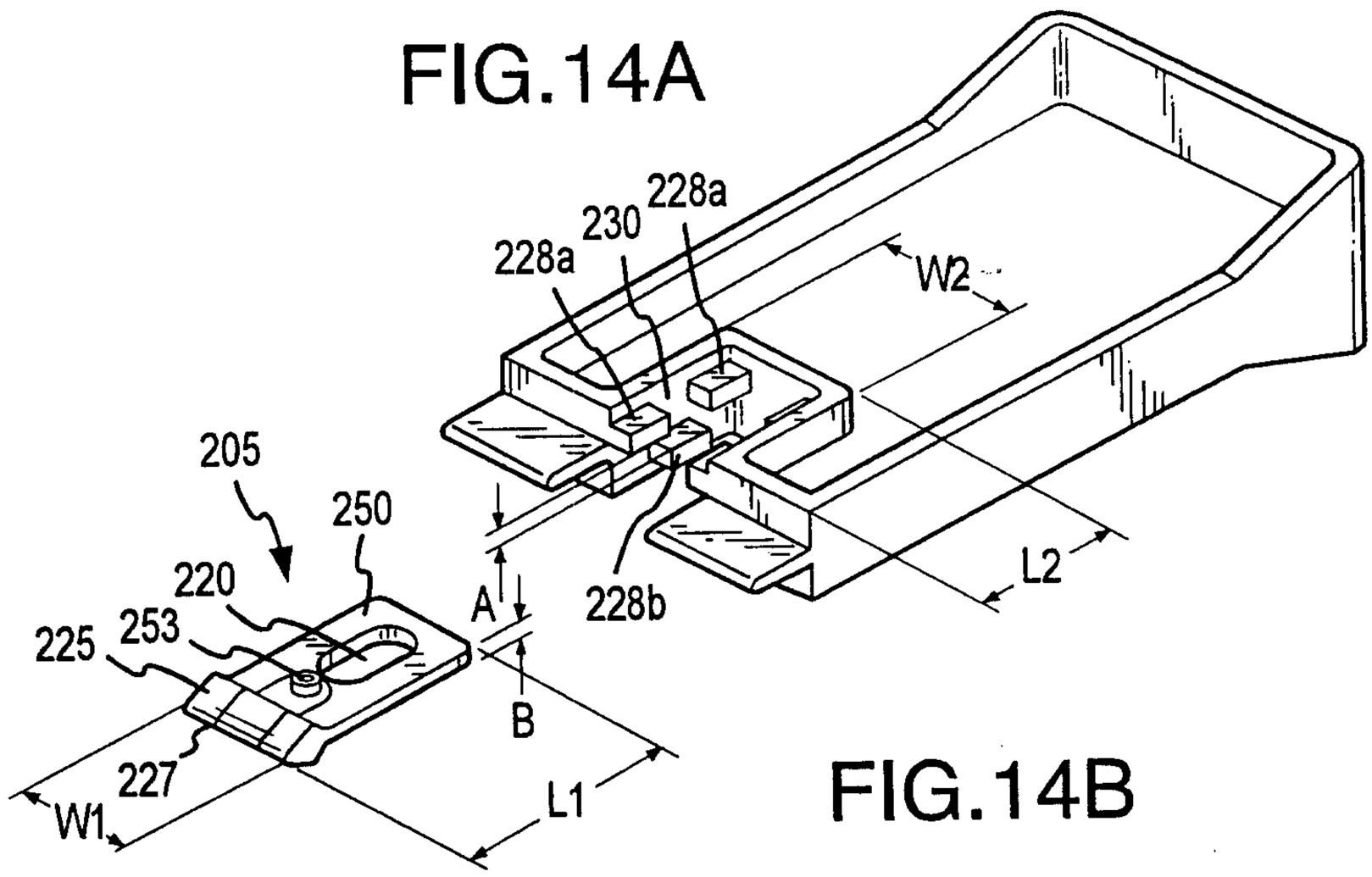


FIG.14B

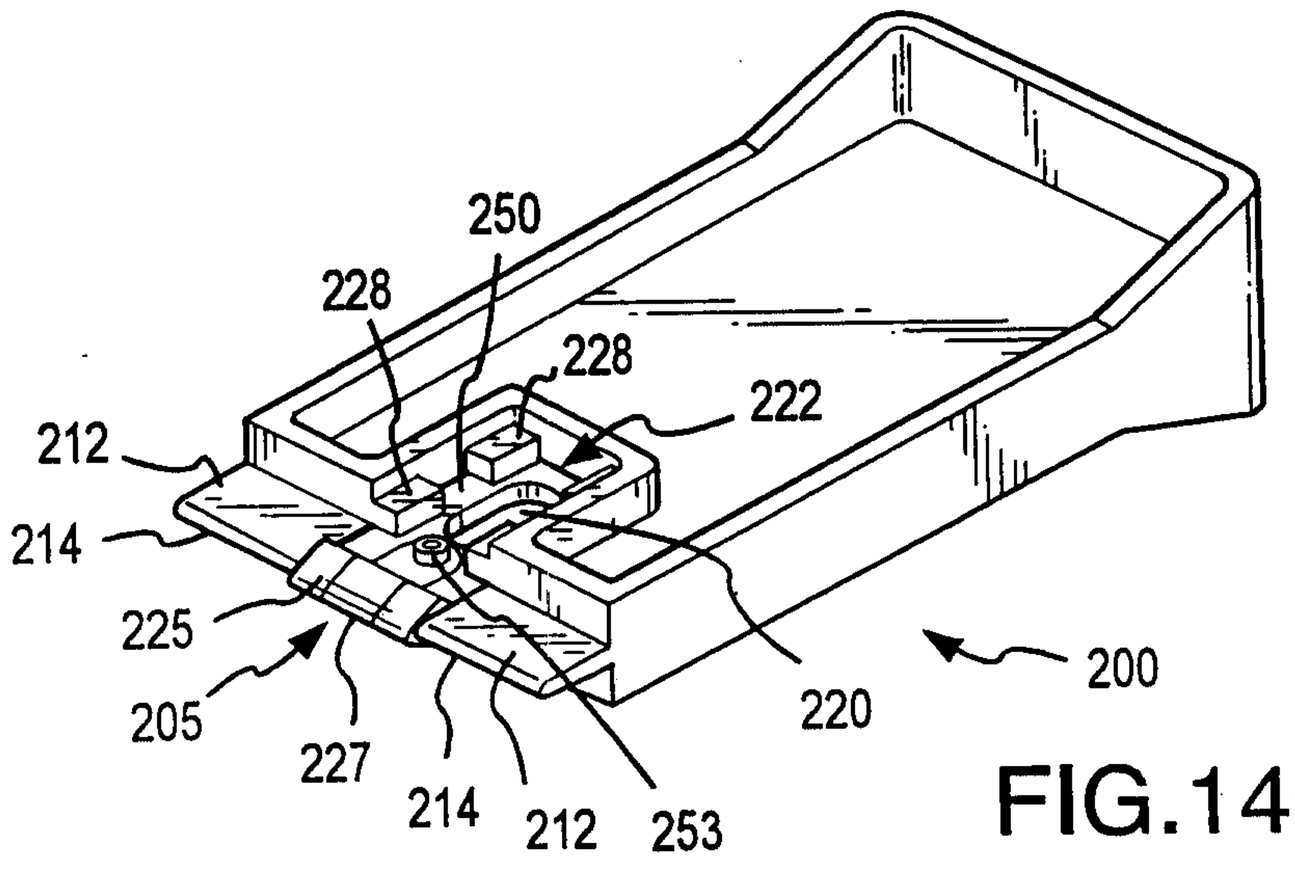


FIG.14C

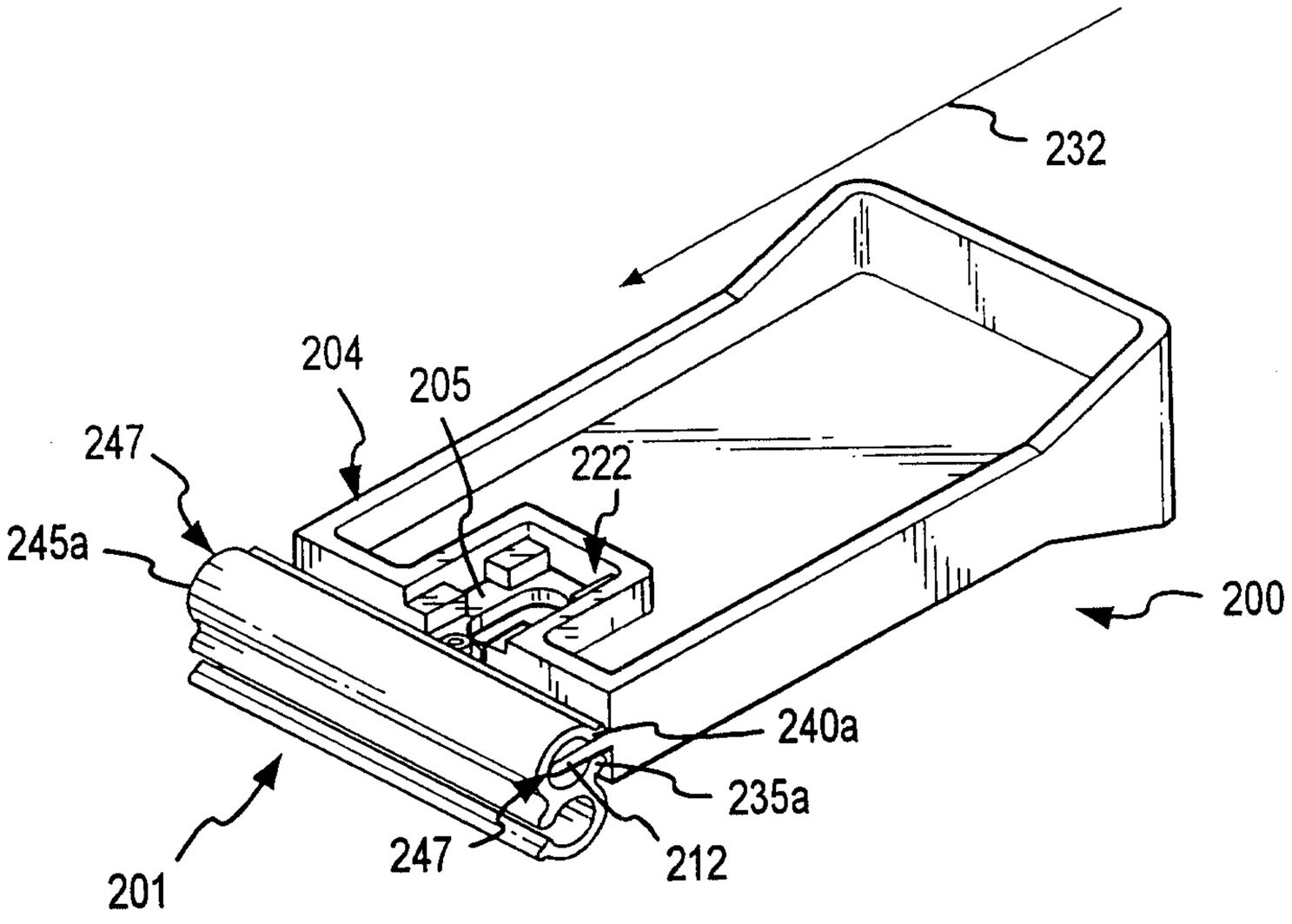


FIG.14D

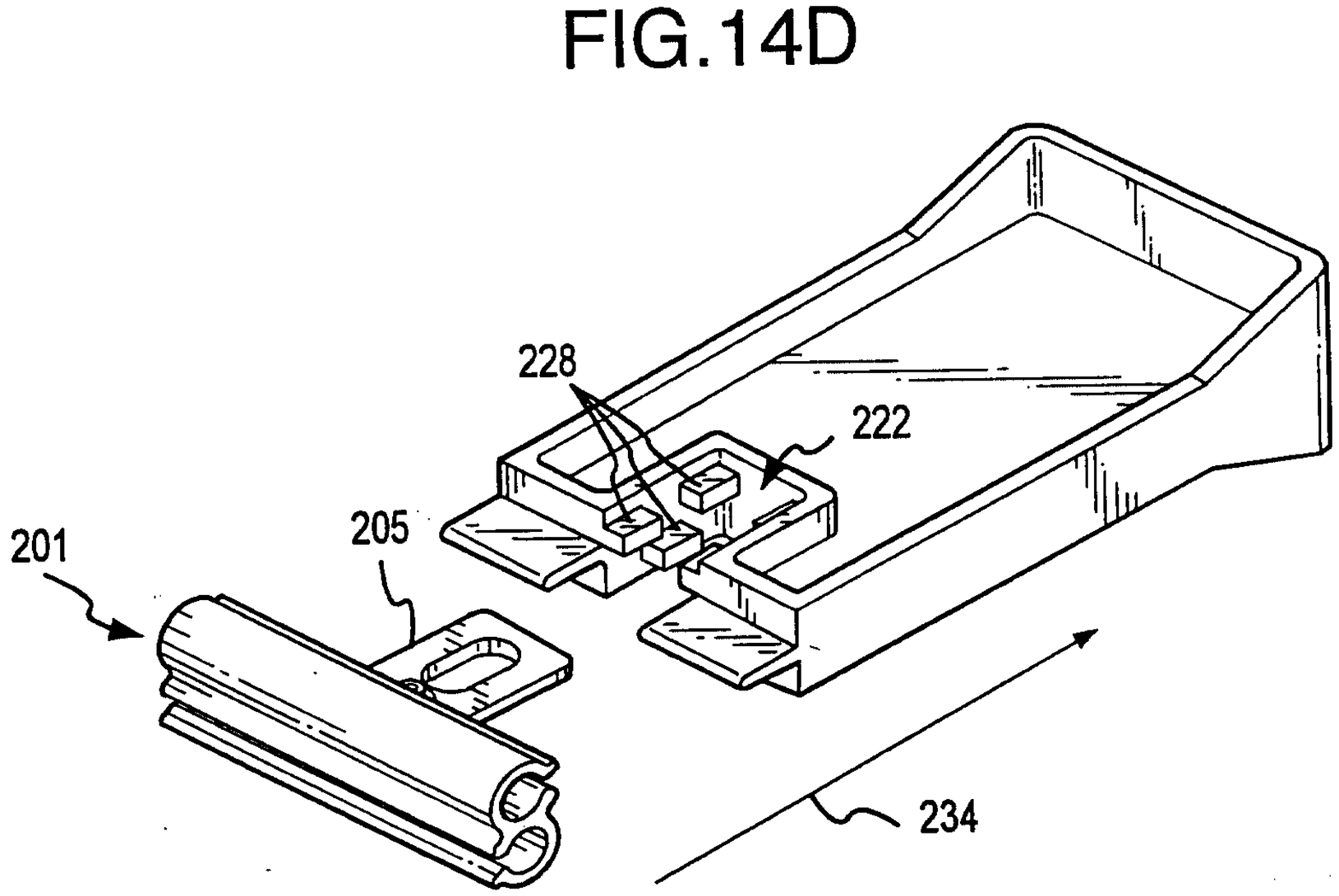
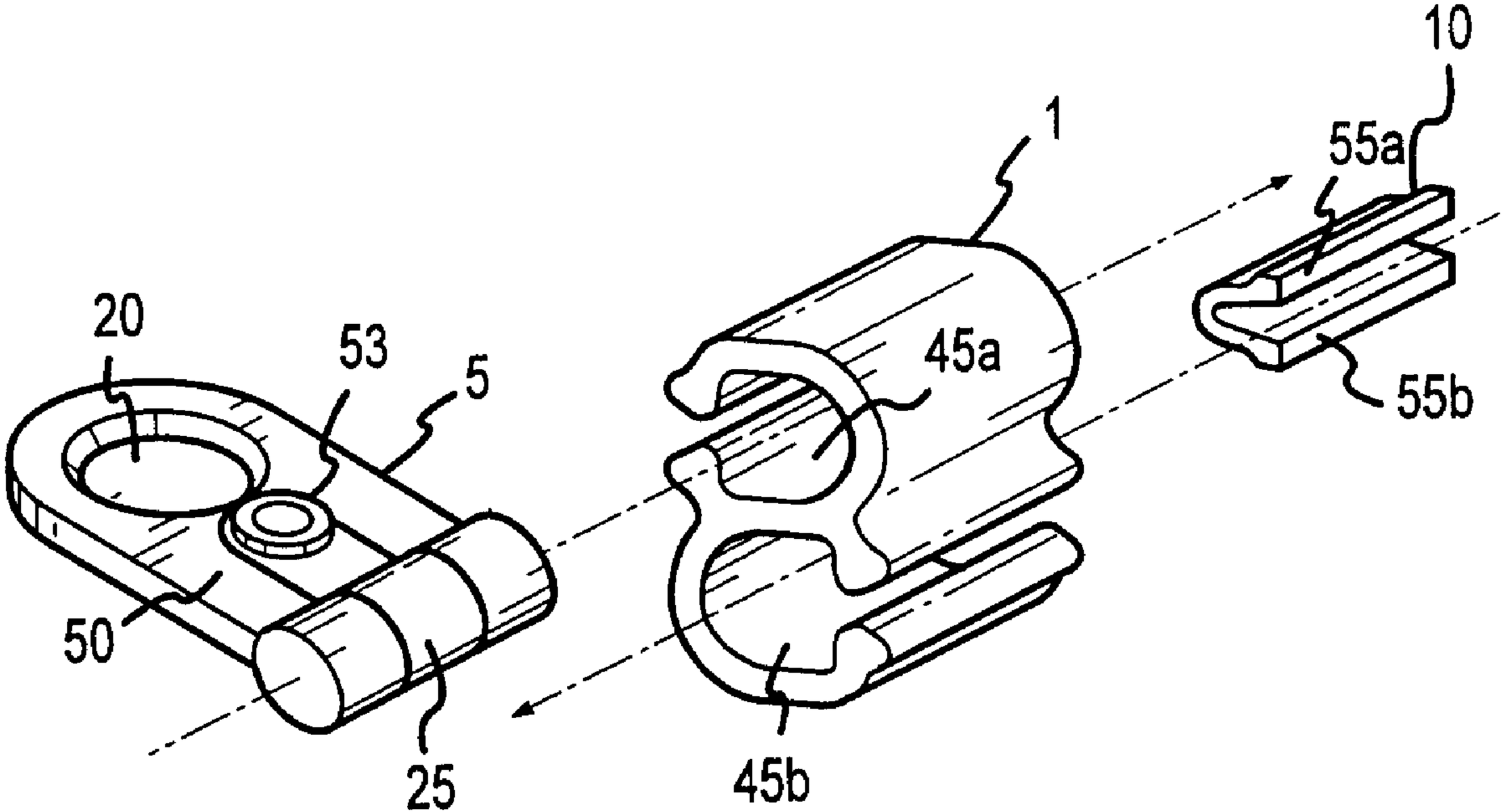


FIG.14E


10
1
55a
20
53
5
45a
55b
50
25
45b