

FLAT-PANEL DISPLAY MOUNTING APPARATUS

BACKGROUND

- [0001] Flat panel displays have become the most common type of display in homes and businesses, in part, because their thin profile allows them to be mounted on a wall. In homes, one common mounting location is above the mantel of a fireplace. In this configuration, the television can present the appearance of a piece of art, but the location is commonly several feet higher than a comfortable viewing height for a seated viewer.
- [0002] Prior art display mounts tilt, extend from a wall (so-called “articulating” mounts), or attach to a ceiling. No mount allows for a generally flat mount to a wall at an elevated position, such as above a mantel, and also allows for comfortable viewing for seated viewers.
- [0003] Display mounts for computer monitors have allowed some degree of height adjustment, but none are suitable for displays that weigh more than approximately 25 – 30 pounds.

SUMMARY

- [0004] The present invention solves the above-described problems and provides a distinct advance in the art of flat-panel display mounts. More particularly, the present invention provides a flat-panel display mount that extends to a height that is comfortable for a seated viewer, can extend beyond a fireplace mantel, supports the weight of the display for easy adjustment, and retracts close to a wall for a pleasing appearance, similar to a piece of hung artwork, when not in use.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

- [0005] Embodiments of the present technology are described in detail below with reference to the attached drawing figures, wherein:
- FIG. 1 is a perspective view of a display mounting apparatus in an extended position with a display attached constructed in accordance with an embodiment of the present invention;

FIG. 2 is a perspective view of a display mounting apparatus of FIG. 1 without the display attached;

FIG. 3 is a perspective view of a display mounting apparatus of FIG. 1 without the attached display and with a display attachment mechanism detached from a display mount main body;

FIG. 4 is perspective view of a wall mount;

FIG. 5 is a perspective view of a support mechanism;

FIG. 6 is a perspective view of a proximal side of a display mount with a display attachment mechanism attached to a main body;

FIG. 7 is an elevation view of the display mount with a display attachment mechanism attached to a main body;

FIG. 8 is an elevation view of the display mount with a display attachment mechanism detached from a main body;

FIG. 9 is a perspective view from the side of the display mounting apparatus in an extended position;

FIG. 10 is a perspective view from the side of the display mounting apparatus between an extended position and a retracted position;

FIG. 11 is a perspective view from the side of the display mounting apparatus in a retracted position;

FIG. 12 is a perspective view of a support structure and a display mount in accordance with a second embodiment of the present invention; and

FIG. 13 is a perspective view of the support mechanism and display mount of the second embodiment;

FIG. 14 is a perspective view of a wall mount and a support structure in accordance with a third embodiment of the invention;

FIG. 15 is a perspective view of a display mount and the support structure of the third embodiment; and

FIG. 16 is a perspective view of the display mount and the support structure of the third embodiment.

[0006] The drawing figures do not limit the present invention to the specific embodiments disclosed and described herein. The drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the technology.

DETAILED DESCRIPTION

[0007] The following detailed description of various embodiments of the present technology references the accompanying drawings which illustrate specific embodiments in which the technology can be practiced. The embodiments are intended to describe aspects of the technology in sufficient detail to enable those skilled in the art to practice them. Other embodiments can be utilized and changes can be made without departing from the scope of the technology. The following detailed description is, therefore, not to be taken in a limiting sense. The scope of the present technology is defined only by the appended claims, along with the full scope of equivalents to which such claims are entitled.

[0008] Note that in this description, references to “one embodiment” or “an embodiment” mean that the feature being referred to is included in at least one embodiment of the present invention. Further, separate references to “one embodiment” or “an embodiment” in this description do not necessarily refer to the same embodiment; however, such embodiments are also not mutually exclusive unless so stated, and except as will be readily apparent to those skilled in the art from the description. For example, a feature, structure, act, etc. described in one embodiment may also be included in other embodiments. Thus, the present invention can include a variety of combinations and/or integrations of the embodiments described herein.

[0009] Turning now to the drawing figures and, in particular, FIGS. 1-3, a display mounting apparatus 10 for a flat-panel display 12 is illustrated and broadly comprises a wall mount 14, a support mechanism 16, and a display mount 18.

[0010] Turning to FIG. 4, the wall mount 14 generally includes a main body 20 and attachment features 22. The main body 20 is generally planar and securely attaches the display mounting apparatus 10 to a wall or other fixed surface. The wall mount 14 may be fabricated from steel, aluminum, an alloy, a composite material, or the like. In various

embodiments, the wall mount 14 may be formed from a single piece of material. In other embodiments, the main body 20 and the attachment features 22 may be separately formed and attached with welds, fasteners, adhesive, or the like.

[0011] The main body 20 may be any shape. In one embodiment, the main body 20 is generally rectangular. Additionally, the main body 20 may include a plurality of attachment holes 24 distributed at various points along its surface for attaching the wall mount 14 to a wall or fixed surface with fasteners such as screws, bolts, pins, lugs, or the like. In this embodiment, the of attachment holes 24 are arranged in substantially horizontal rows where each attachment hole 24 is uniformly spaced from each of its neighboring attachment holes 24. The spacing between adjacent attachment holes 24 may be 1 inch (2.54 cm), 2 inches (5.08 cm), or any other spacing as needed under the circumstances. Thus, the attachment holes 24 facilitate securely anchoring the wall mount 14 into regularly spaced wall studs, or the like. In some embodiments, the attachment holes 24 may be horizontally extended slots to facilitate horizontal adjustment of the display mounting apparatus 10 while enabling the fasteners into wall studs contained within the wall of a building or structure.

[0012] The attachment features 22 facilitate attaching the support mechanism 16 to the wall mount 14 and may comprise flanges, raised knuckles, raised portions of the main body 20, or the like. In this embodiment, the attachment features 22 may include a plurality of spaced-apart flanges with a pin-receiving hole therethrough, like a clevis.

[0013] In some embodiments, the main body 20 may include various reinforcing features 26 to support the attachment features 22 or improve the rigidity or strength of the wall mount 20. The reinforcing features 26 may comprise raised knuckles, raised portions of the main body, cut-out portions of the main body 20, or various other structures that increase the strength or rigidity of the main body 20.

[0014] Turning to FIG. 5, the support mechanism 16 pivotally connects the wall mount 14 to the display mount 18 and includes a lower support arm 28, an upper support arm 30 and, in some embodiments, the support mechanism 16 may further include a lift mechanism 32.

[0015] The lower support arm 28 may be fabricated from various metals, alloys, composite materials, or the like. The lower support arm 28 includes a proximal attachment point 34

at a proximal end of the lower support arm 28 and a distal attachment point 36 at a distal end of the lower support arm 28. Each lower support arm 28 is pivotally connected at the proximal attachment point 34 to a corresponding attachment feature 22 of the main body 20 with a fastener 38 such as bolts, pins, screws, lugs, or the like. Correspondingly, the lower support arm 28 is pivotally connected at the distal attachment point 36 to the display mount 18 with fasteners 40 such as bolts, pins, screws, lugs, or the like.

[0016] The upper support arm 30 may be fabricated from various metals, alloys, composite materials, or the like. The upper support arm 30 includes a proximal attachment point 42 at a proximal end of the upper support arm 30 and a distal attachment point 44 at a distal end of the upper support arm 30. Each upper support arm 30 is pivotally connected at the proximal attachment point 42 to a corresponding attachment feature 22 of the main body 20 with a fastener 46 such as bolts, pins, screws, lugs, or the like. Correspondingly, each upper support arm 30 is pivotally connected at the distal attachment point 44 to the display mount 18 with fasteners 48 such as bolts, pins, screws, lugs, or the like. The upper support arm 30 may be the same length as the lower support arm 28 or it may be a different length.

[0017] In some embodiments, the lift mechanism 32 connects the support mechanism 16 to an attachment feature 22 of the wall mount 14 and includes a first attachment point 50 and a second attachment point 52 at its distal ends. The first attachment point 50 connects the lift mechanism 32 to an attachment feature 22 of the wall mount 14 with a fastener 54, such as a bolt, a screw, a pin, a lug, or the like, and the second attachment point 52 connects the lift mechanism 32 to the support mechanism 16 with a fastener 56, such as a bolt, a screw, a pin, a lug, or the like. The lift mechanism 32 may be a linear actuator, a gas spring, an air spring, an extension spring, a safety drawbar spring, a torsion spring, a polymeric band, or the like.

[0018] Turning to FIGS. 6-8, the display mount 18 provides a secure attachment point for the display 12 and broadly includes a main body 58, an upper support arm attachment point 60, a lower support arm attachment point 62, and a display attachment mechanism 64.

[0019] The main body 58 is generally planar supports and further includes upper support arm attachment point 60, lower support arm attachment point 62, and the display

attachment mechanism 64. The main body 58 may be fabricated from various metals, alloys, composite material, or the like. In some embodiments, the main body 58 is separately formed from the attachment upper support arm attachment points 60, the lower support arm attachment points 62 and attached with welds, fasteners, adhesive, or the like. In some embodiments, the main body 58 may include a display securing mechanism flange 66 having a hole 68 therethrough, as described in more detail below.

[0020] The upper support arm attachment point 60 pivotally connects the distal attachment point 44 of the upper support arm 30 to the main body 58 of the display mount 18 with a fastener 48 such as a pin, screw, lug, bolt, or the like. The lower support arm attachment point 62 pivotally connects the distal attachment point 36 of the lower support arm 28 to the main body 58 of the display mount 18 with a fastener 40 such as a pin, screw, lug, bolt, or the like.

[0021] The display attachment mechanism 64 removably attaches the display 12 to the display mount 18 and broadly comprises an attachment plate 70 and, in some embodiments, a securing mechanism 72.

[0022] The attachment plate 70 removably attaches to a rear portion of the display 12 with fasteners such as screws, bolts, lugs, pins, or the like. In some embodiments, the attachment plate 70 may utilize spacers, stand-offs, washers, or the like, to extend the rear portion of the display 12 away from the attachment plate 70. The attachment plate 70 may be fabricated from various metals, alloys, composite materials, or the like.

[0023] The securing mechanism 72 removably attaches the attachment plate 70 to the main body 58 and, in this embodiment, further comprises an upper flange 74, a lower flange 76 and a fastener 78. The upper flange 74 is generally U-shaped and extends from an end of the attachment plate 70 and is operable to receive a corresponding flange 80 on a distal side of the main body 58 between the upper flange 74 and the attachment plate 70. The lower flange 76 includes a hole 82 therethrough and, when placed within a slot or hole 84 in the main body 58, the hole 82 of the lower flange 76 is axially aligned with the hole 68 of the display securing mechanism flange 66 and secured therein with the fastener 78 such as a screw, bolt, lug, pin, or the like. Thus, the upper flange 74, the lower flange 76, and

the fastener 78 secure the display attachment mechanism 64 in place on the distal side of the main body 58.

[0024] Turning to FIGS 9-11, in use, the display mounting apparatus 10 is attached to a wall of a structure with one or more fasteners and the attachment plate 70 is attached to the rear side of a display 12 with one or more fasteners. The upper flange 74 of the securing mechanism 72 is positioned over the flange 80 on the distal side of the main body 58 and the lower flange 78 is secured to the securing mechanism flange 66 with a fastener 78, such as a pin. Thus, the display 12 is secured to the display mounting apparatus 10.

[0025] The display mounting apparatus 10 may be extended to lower the display 12 to use the display at a comfortable viewing height and may be retracted when the display 12 is not in use. For example, the display mounting apparatus 10 may be attached over a mantel of a fireplace to provide an improved viewing angle when extended and provide attractive positioning when retracted. The display 12 may be further fitted with a decorative frame around its peripheral edge to provide the appearance of hanging artwork when the display mounting apparatus 10 is retracted.

[0026] FIGS. 12 & 13 illustrate another embodiment of a display mounting apparatus 100. This embodiment is substantially similar to the embodiment described with reference to FIGS. 1 - 11, except as indicated. In this embodiment, each upper support arm 102 further comprises a cam 104 at its distal end. Various shapes may be used for the cam 104. Correspondingly, the securing mechanism 106 further comprises a cam follower flange 108 and a cam follower 110. Thus, when the cam follower 110 is engaged within the cam 104, the securing mechanism is supported by the cam 104 at an upper end and a lower flange, such as lower flange 76, at a lower end.

[0027] The cam 104 is shaped such that the securing mechanism 106 is generally vertical when the display mounting apparatus 100 is in a retracted position and, when moved to an extended position, the top of securing mechanism 106 moves distal to a wall mount, such as wall mount 14. Thus, the display mounting apparatus 100 can automatically tilt downward, relative to a viewer, whenever the display mounting apparatus 100 is in an extended position and return to a substantially vertical orientation when the display mounting apparatus 100 is in a retracted position.

[0028] FIGS. 14-16, illustrate yet another embodiment of a display mounting apparatus 200 for supporting a display 202. This embodiment is substantially similar to the embodiment described with reference to FIGS. 1 - 11, except as indicated.

[0029] The display mounting apparatus 200 broadly comprises a wall mount 204, a support mechanism 206, and a display mount 208. The wall mount 204 is substantially similar to the wall mount 14 of FIGS. 1-11 but, in addition, the wall mount 204 further comprises a lock receiver 210 extending from a peripheral edge of the wall mount 204. The lock receiver 210 includes a lock-receiving hole 212 therein and has a generally tapered shape, as described in more detail below.

[0030] The display mount 208 is substantially similar to the display mount 18 of FIGS 1-11 but, in addition, the display mount 208 further comprises a lock mechanism support 214, a handle 216, and a lock mechanism 218. In this embodiment the lock mechanism further comprises a lock pin 220, a spring 222, and a stop 224. In other embodiments,, other locking or securing mechanisms may be used including mechanical, magnetic, and electronic locking mechanisms.

[0031] The lock mechanism support 214 is a flange that extends generally perpendicular from the main body 226 of the display mount 208. The lock mechanism support 214 may be fabricated from metal, various alloys, composite materials, or the like. In some embodiments, the lock mechanism support 214 is separately formed from the main body 226 and attached with welds, fasteners, adhesive, or the like. In other embodiments the lock mechanism support 214 and the main body 226 may be a unitary piece. The lock mechanism support 214 has a hole 228 therethrough to support the lock pin 220.

[0032] The handle 216 is secured to the lock pin 220 and provides a convenient mechanism to unlock the display mount 208 from its retracted position. The handle is positioned relative to the display 202 so that an user can easily manipulate the handle by placing a hand on the bottom peripheral edge of the display 202 and wrapping one or more fingers around the back of the display 202.

[0033] The lock pin 220 attaches at a first end to a side of the handle 216 and is positioned within the hole 228 in the lock mechanism support 214. The second end of the lock pin

220 has an angled face 230 to enable easier securing of the locking mechanism 218, as described in more detail below.

[0034] The spring 222 surrounds the lock pin and, when combined with the stop 224, places the lock pin 220 in an extended position nominally.

[0035] The stop 224 fixedly attaches to the lock pin and allows the spring 222 to push against the stop 224 and thereby move the lock pin 220 into its nominal extended position.

[0036] In this embodiment, the support mechanism 206 includes two lower support arms, 226. Each lower support arm 226 is supported by a lift mechanism 228.

[0037] In use, the display mounting apparatus 200 is used as described above with regard to FIGS 1-11. However, when moved to a retracted position, the lock pin 220 contacts the lock receiver 210. Due to the tapered shape of the lock receiver 210 and the angled face 230 of the lock pin, the lock pin 230 is forced downward from its nominal extended position. As the display mount 208 is placed in a fully retraced position, the lock pin 230 engages the lock-receiving hole 212 and extends to its nominal position by way of the force exerted by spring 222 acting on stop 224.

[0038] To move the display mounting apparatus 200 to an extended position, the user may manipulate the handle 216 to disengage the lock pin 220 from the lock receiver 210. The display mount 208 will extend, supported by the support mechanism 206, to a fully extended position.

[0039] Some embodiments of the present invention may further utilize a computer processor such as a central processing unit (CPU), field-programmable gate array (FPGA), application specific integrated circuit (ASIC), or the like, to control various subsystems, such as a positioning subsystem, a control subsystem, or an environmental monitoring subsystem. The various subsystems may be separate or combined, and may utilize or share data between subsystems.

[0040] In some embodiments, the positioning subsystem may utilize a linear actuator, stepper motor, or the like, as a lift mechanism, such as lift mechanism 32 of FIGS. 1-11, or to position the lift mechanism. Thus, the positioning subsystem can cause the lift mechanism to extend the display mounting apparatus or retract the display mounting apparatus based on the position of the linear actuator, stepper motor, or the like. In some

embodiments the positioning subsystem may signal a video switching subsystem to change a video source. Thus, when in the display mounting apparatus is in a retracted position the video switching subsystem may display a first video source and, when the display mounting apparatus is in an extended position, the video switching subsystem may display a second video source. For example, the video switching subsystem may display a slideshow of photos when the display mounting apparatus is in a retracted position and a DVD movie when in an extended position.

[0041] In some embodiments, the control subsystem may allow a user to adjust the position of the display mounting apparatus through a switch, infrared (IR) control, radio frequency (RF) control, motion control through video capture, interface to a home automation system, or the like. The control subsystem may further comprise an antenna, IR receiver, video camera, ASIC, or the like. In some embodiments, the control subsystem may interface with a home automation system such as Crestron®, AMX®, Z-Wave®, Insteon®, Control 4®, or the like. When the control subsystem receives an appropriate signal from the home automation system, the control subsystem can signal the positioning subsystem to move the display mounting apparatus appropriately. In other embodiments, an IR receiver is placed on the front of the display and the control subsystem can signal the positioning subsystem based on IR commands issued from an IR remote control. In yet other embodiments, a video camera may be used to raise the display to a retracted position when a user makes a first predetermined movement. Similarly, the display may be extended when a user makes a second predetermined movement.

[0042] In some embodiments, the environmental monitoring subsystem may monitor for certain conditions, such as heat, humidity, or pressure and may signal the control subsystem to adjust the position of the display mounting apparatus. For example, if the display mounting apparatus is located over a fireplace mantel, extreme heat from a fire may damage the sensitive electronics of a display. A temperature sensor placed on a lower edge of the display mount may sense a temperature over a predetermined temperature threshold and signal to the positioning subsystem to retract the display mount to avoid damage to the display caused by heat. In another example, embodiments of the present invention may be used on an outdoor patio. If a water or humidity sensor placed on an

upper edge of the display mount senses water or elevated humidity, the environmental monitoring subsystem may signal the positioning subsystem to retract the display to minimize the chance of damage due to water. In yet another example, a pressure or contact sensor may be placed at various points around the display mounting apparatus and/or display to avoid incidental contact with, and damage to, objects or people in the immediate vicinity of the display mounting apparatus. When retracting, the pressure or contact sensor may detect an object behind the display or display mount and signal to the positioning subsystem to stop retracting or to extend to avoid damage or injury. Various other monitoring is also possible.

[0043] In some embodiments, the display mounting apparatus may further include a guide to position cables away from the moving parts of the display mounting apparatus. The guide may be located on a lower support arm or an upper support arm.

[0044] In some embodiments, a shroud may be attached around a peripheral edge of the wall mount that extends to and attach around a peripheral edge of the display mount. The shroud would enclose the mechanical elements of the display mount and provide for a more attractive appearance. The should may be fabric, or various other materials.

[0045] Although the invention has been described with reference to the preferred embodiment illustrated in the attached drawing figures, it is noted that equivalents may be employed and substitutions made herein without departing from the scope of the invention as recited in the claims.

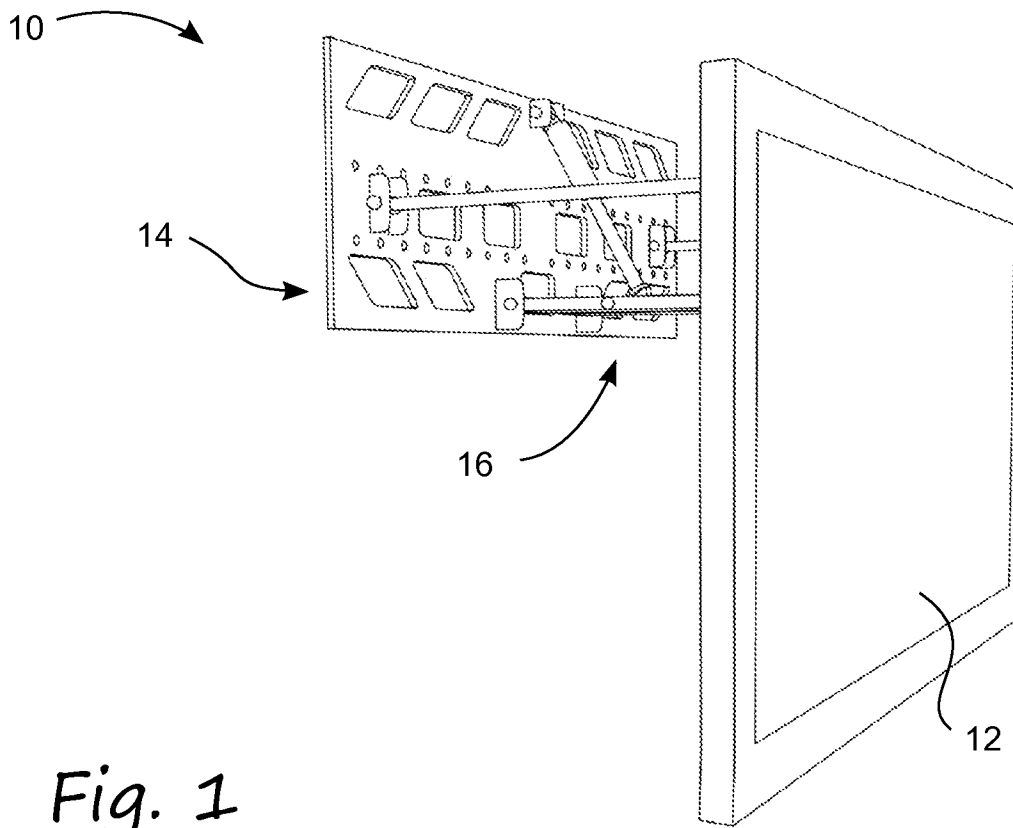


Fig. 1

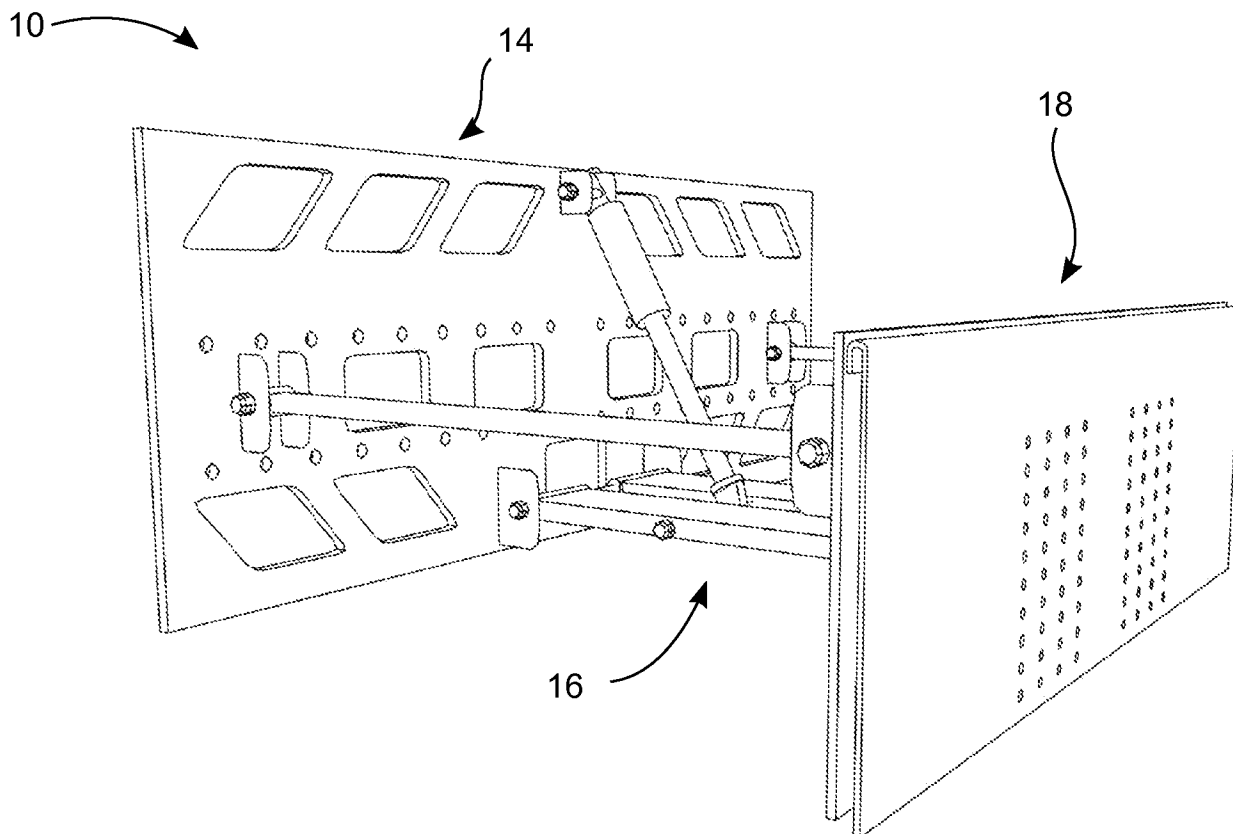


Fig. 2

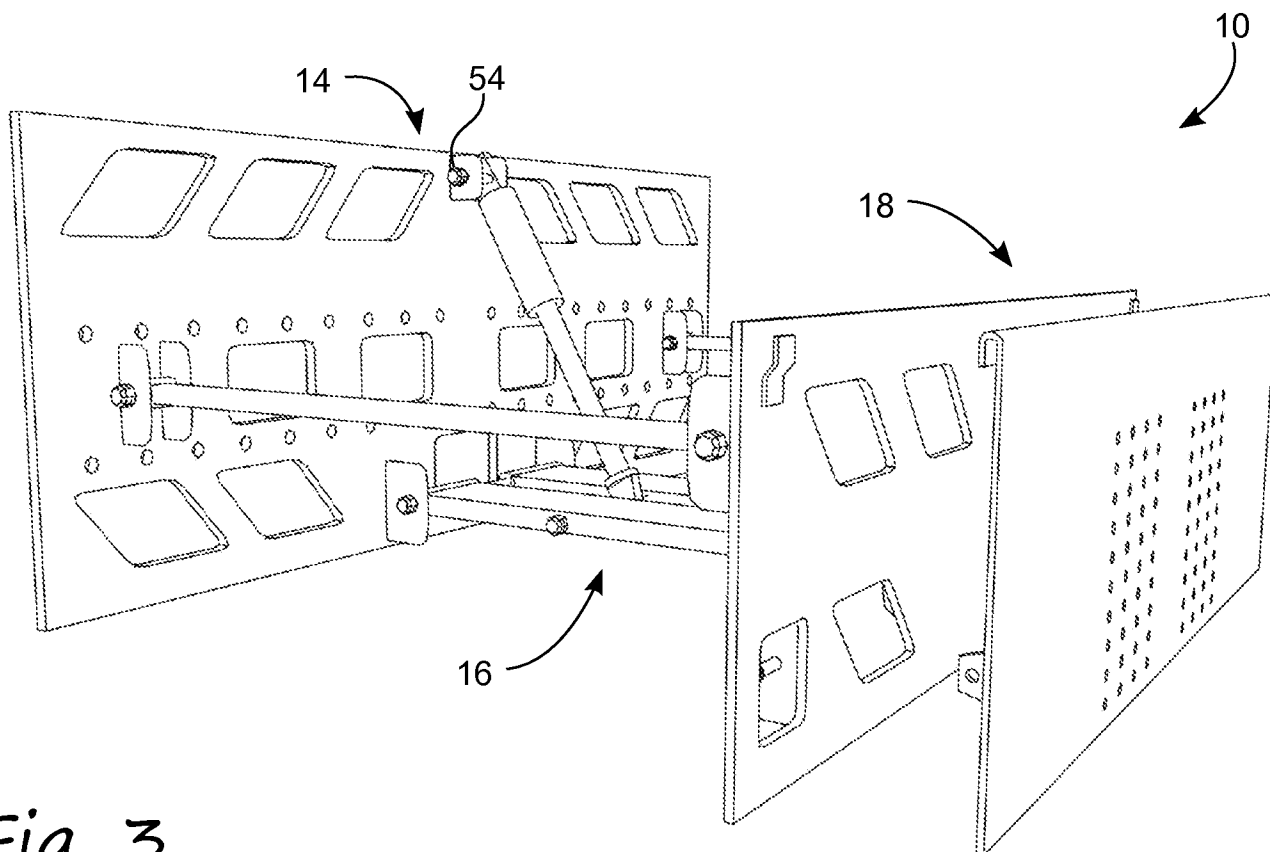


Fig. 3

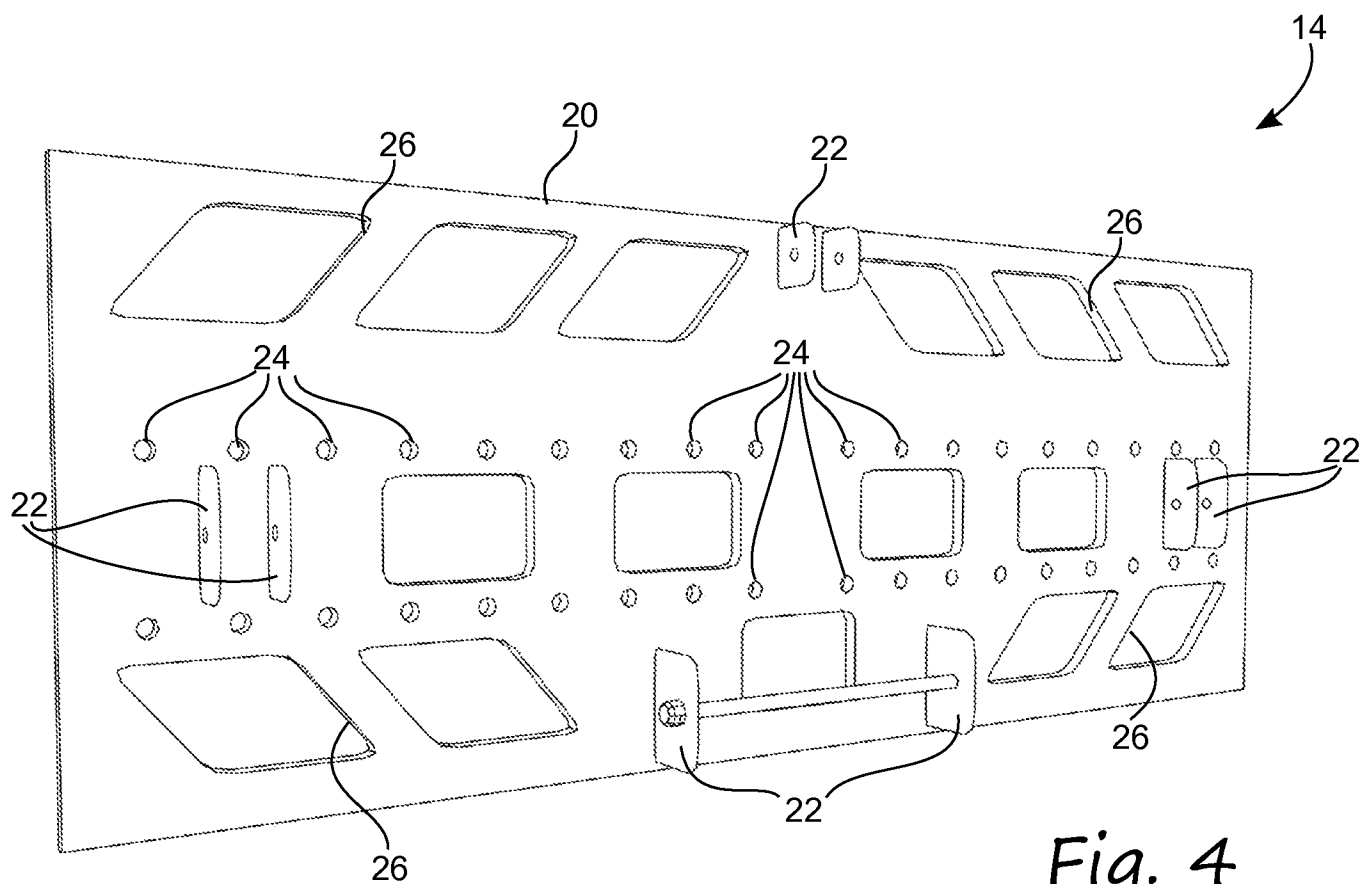


Fig. 4

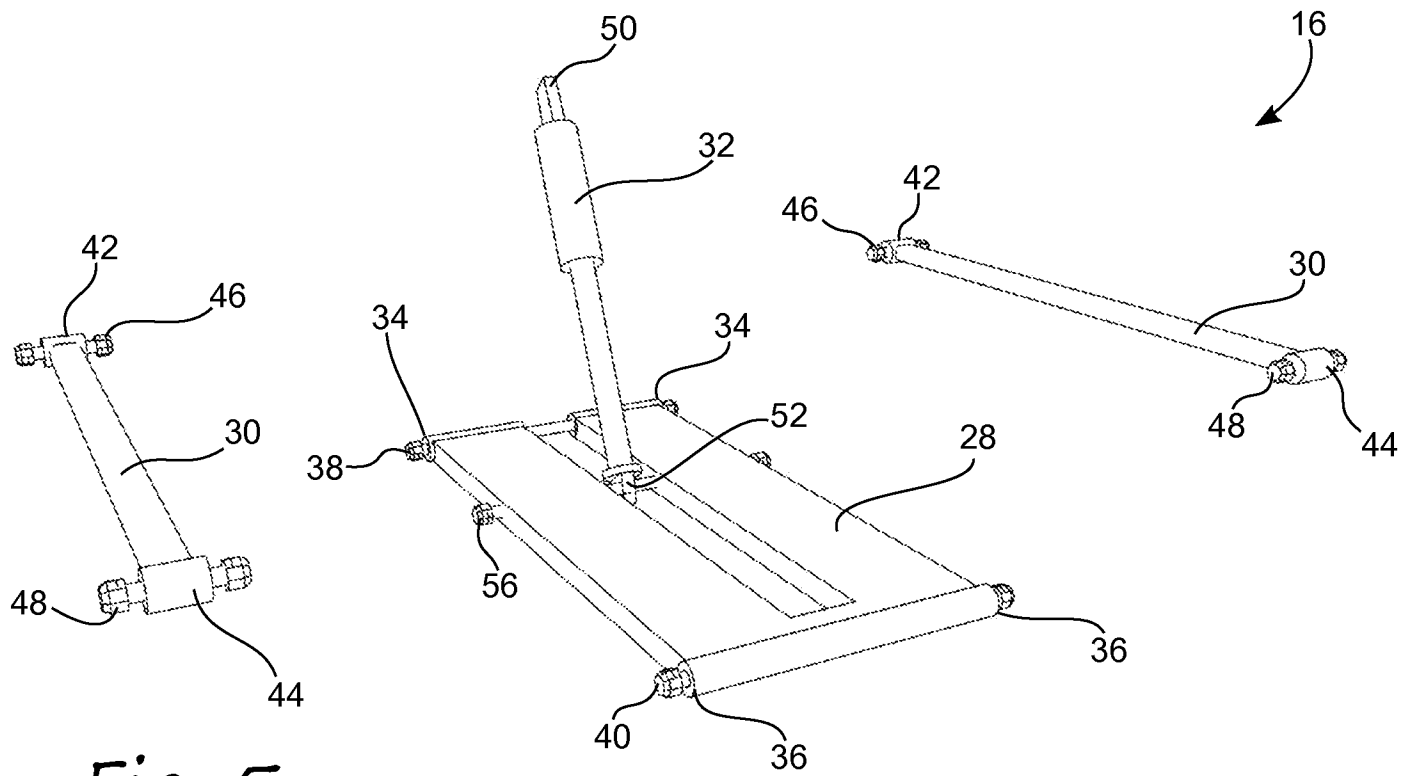


Fig. 5

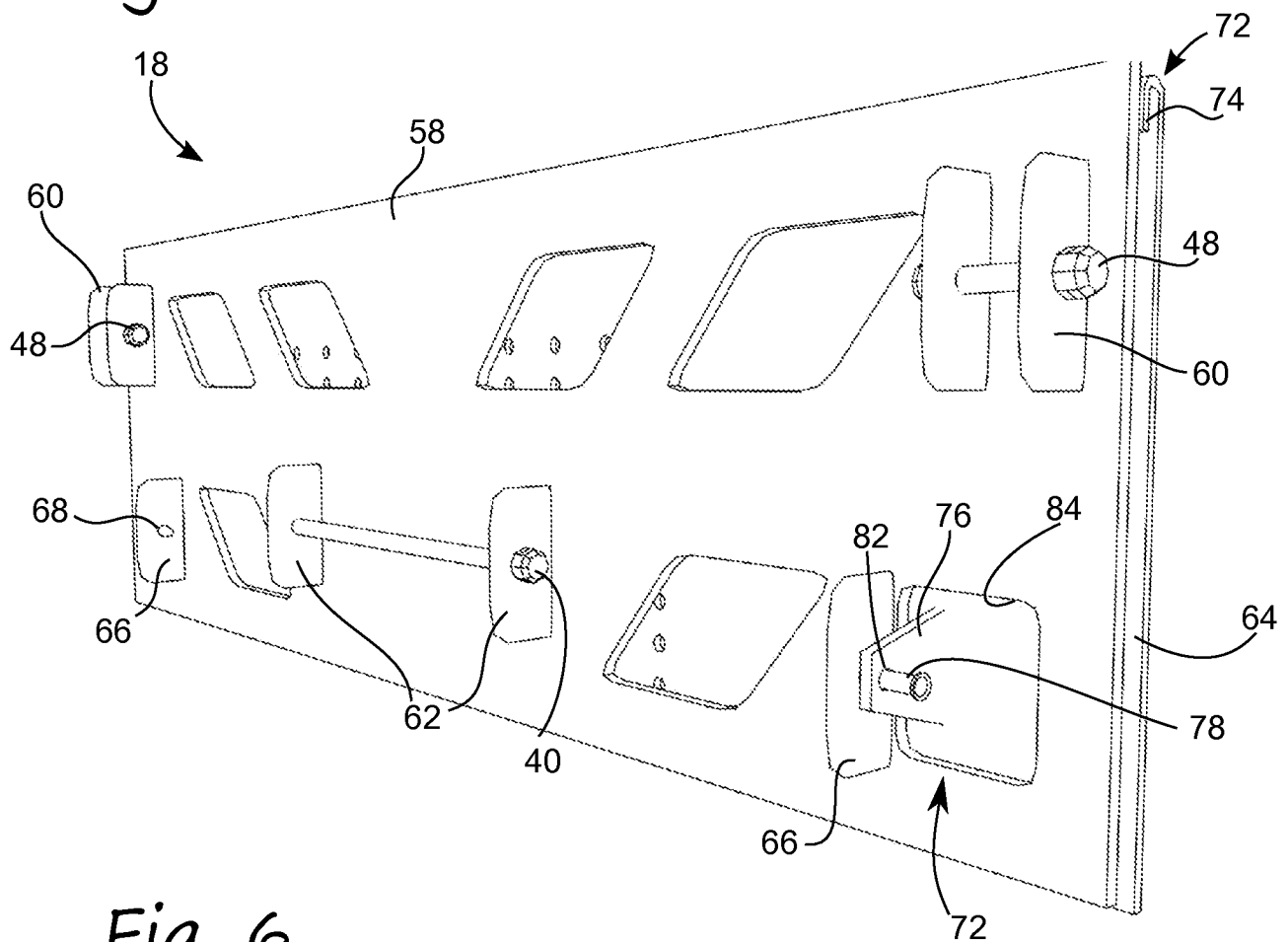


Fig. 6

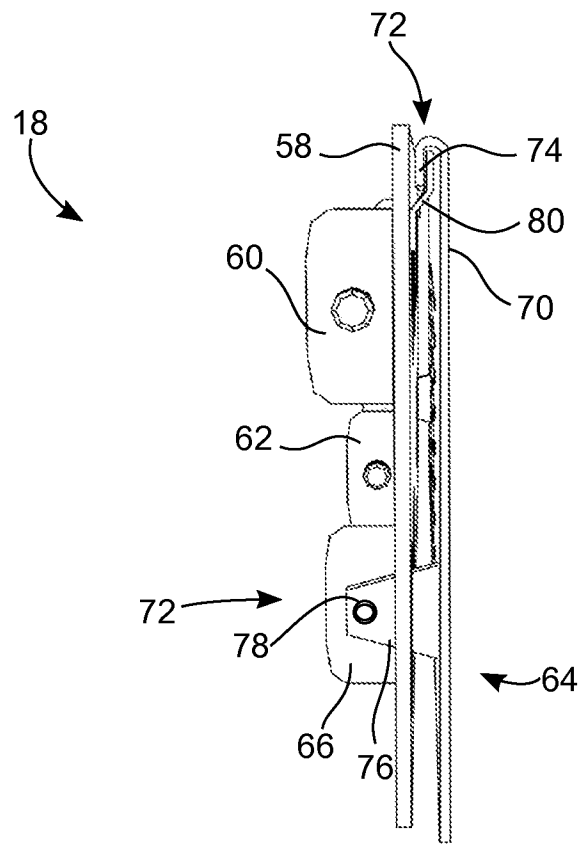


Fig. 7

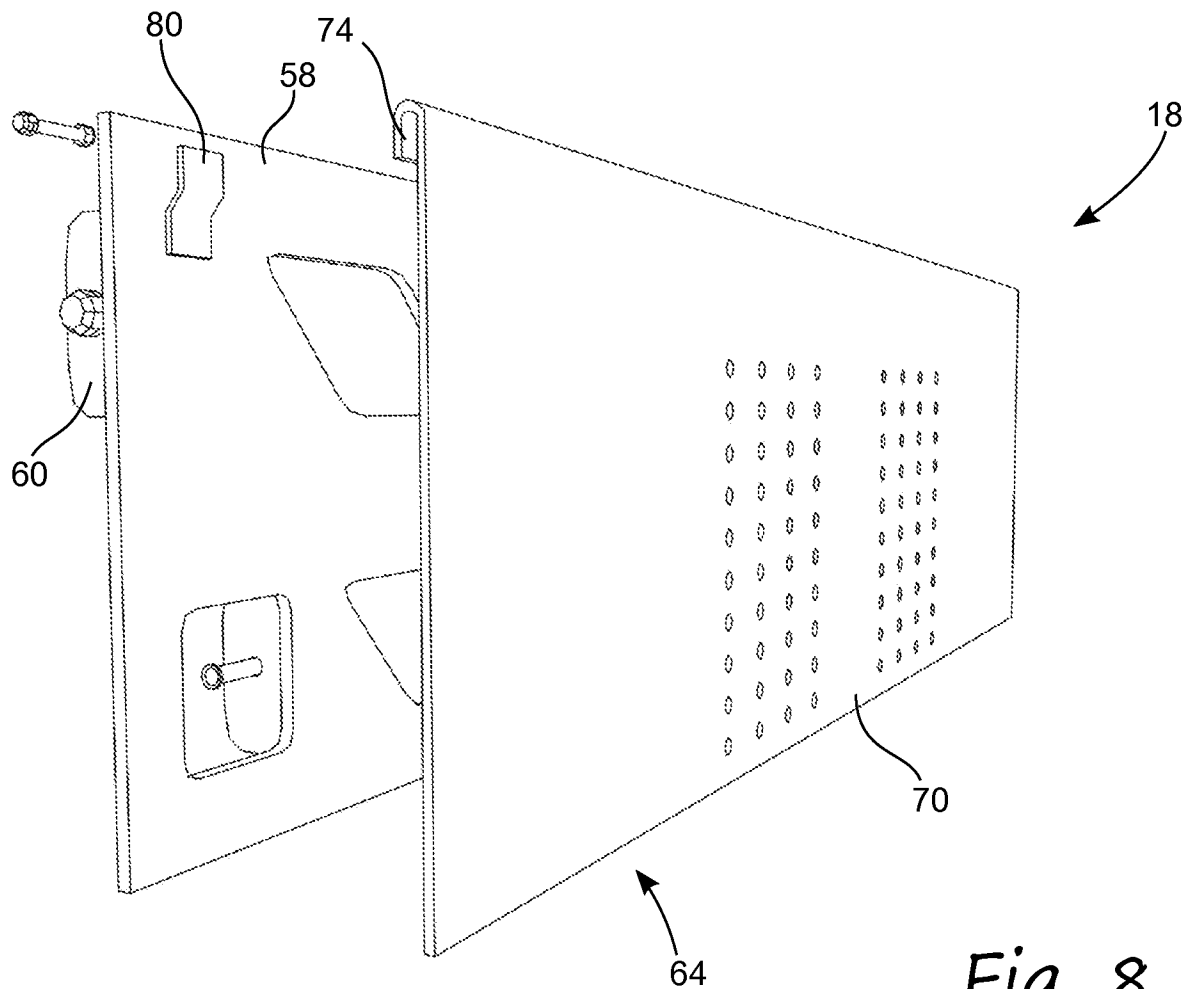


Fig. 8

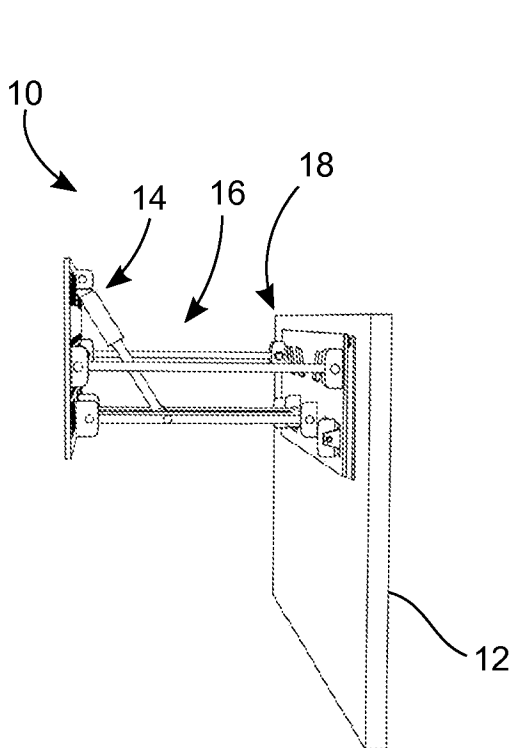


Fig. 9

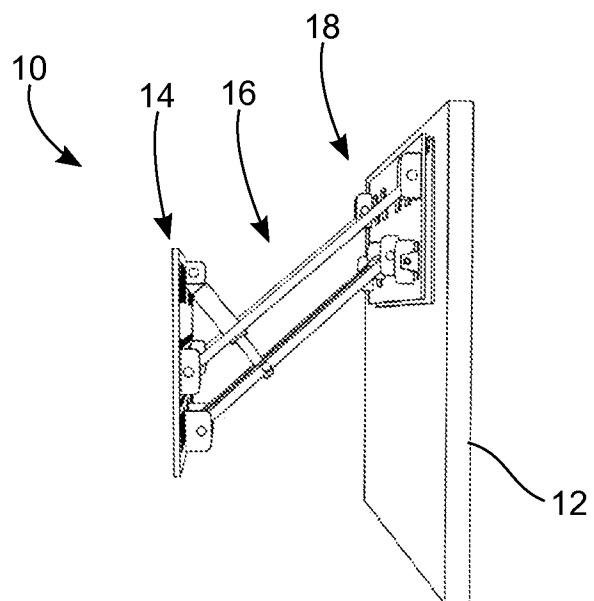


Fig. 10

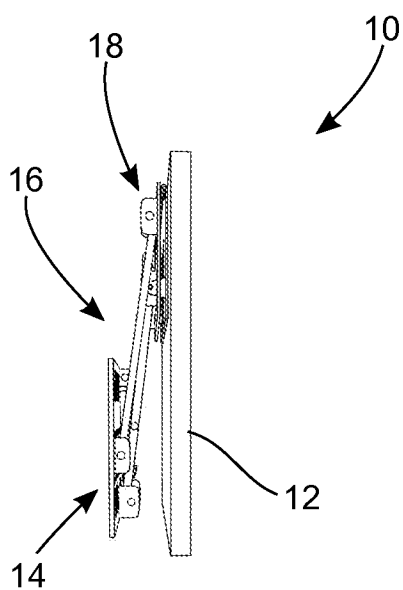


Fig. 11

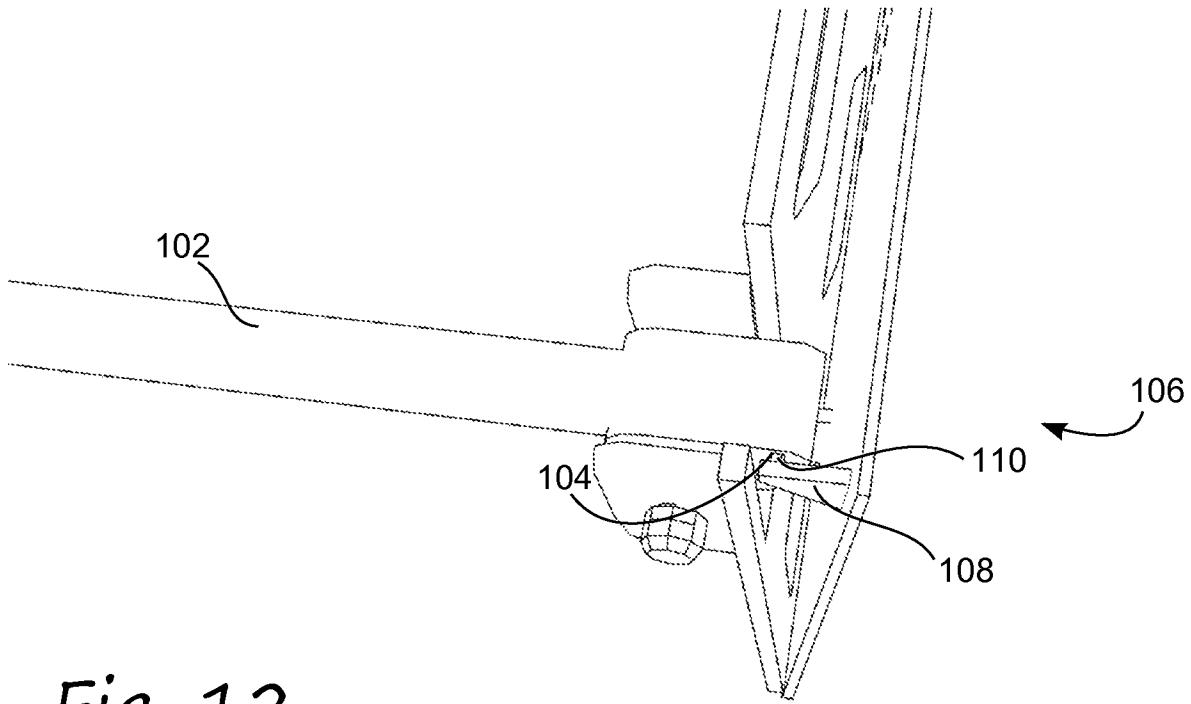


Fig. 12

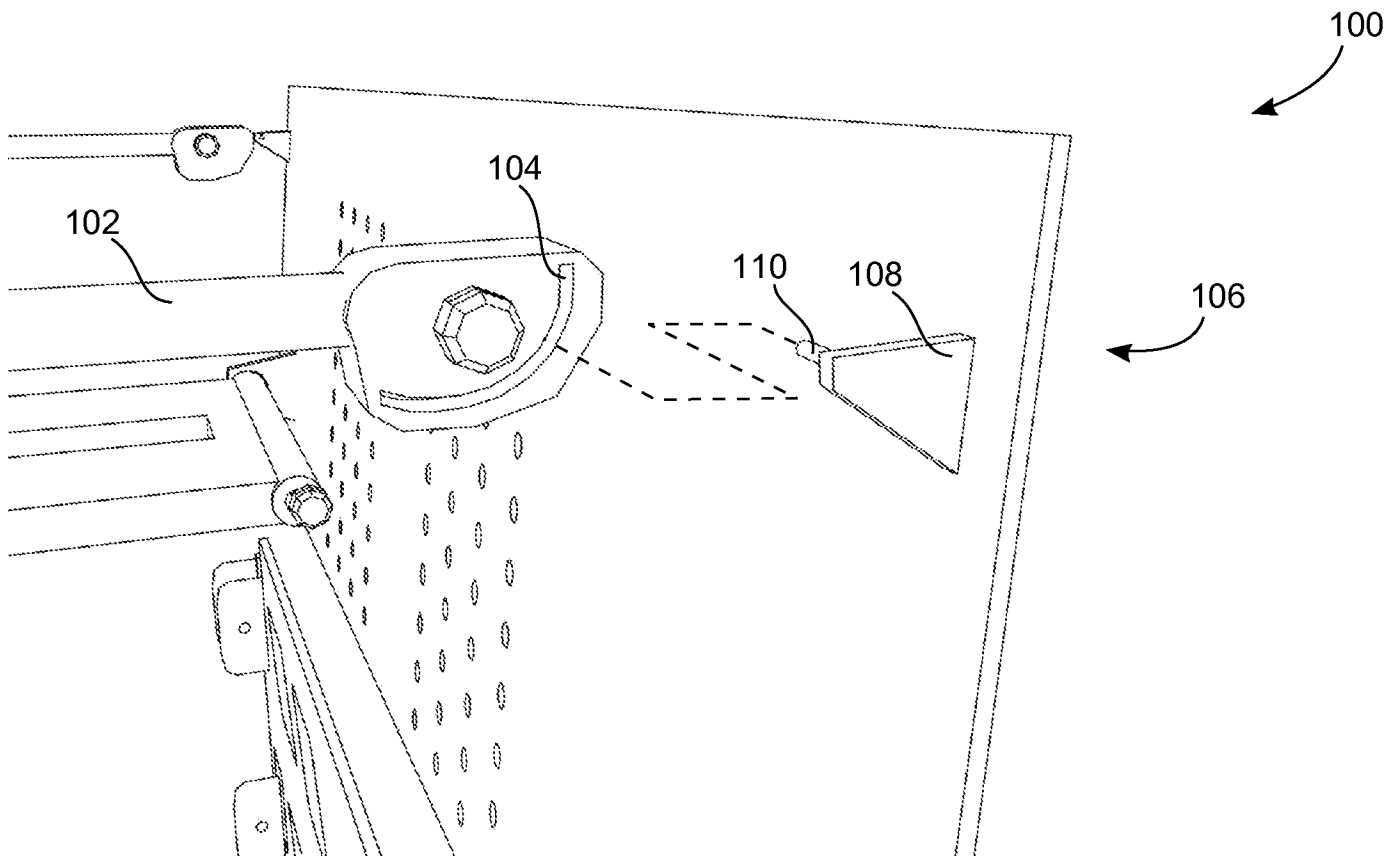


Fig. 13

Fig. 14

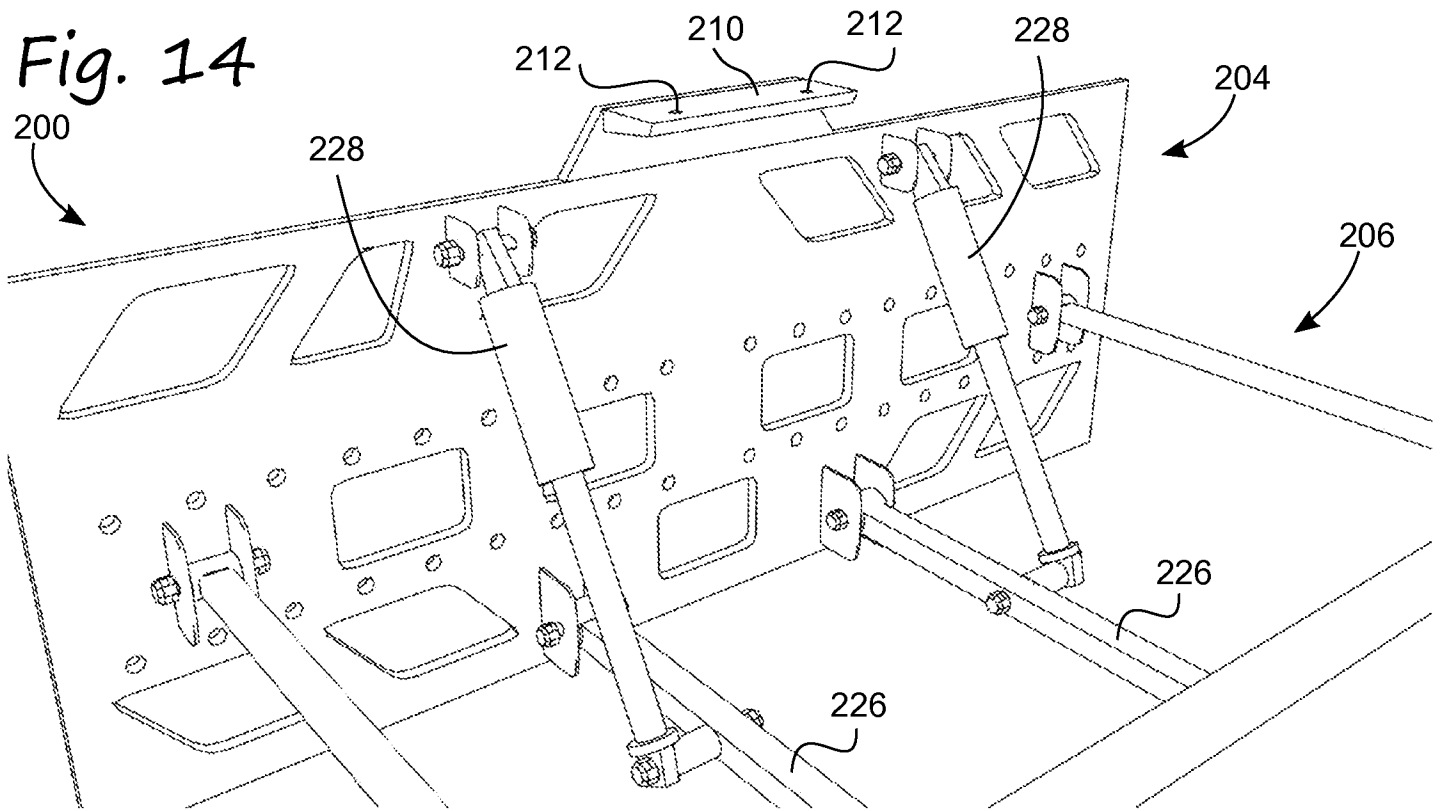
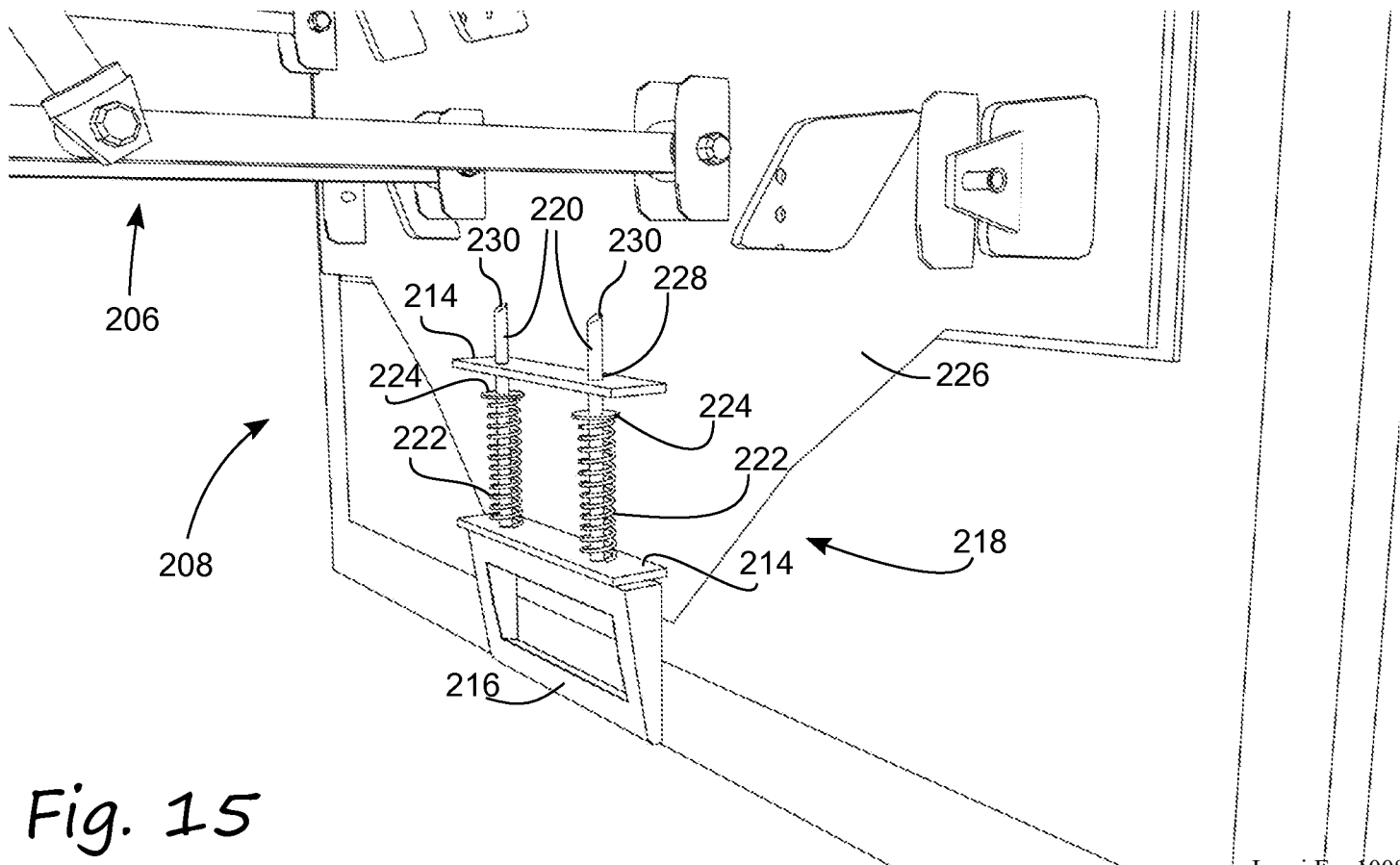


Fig. 15

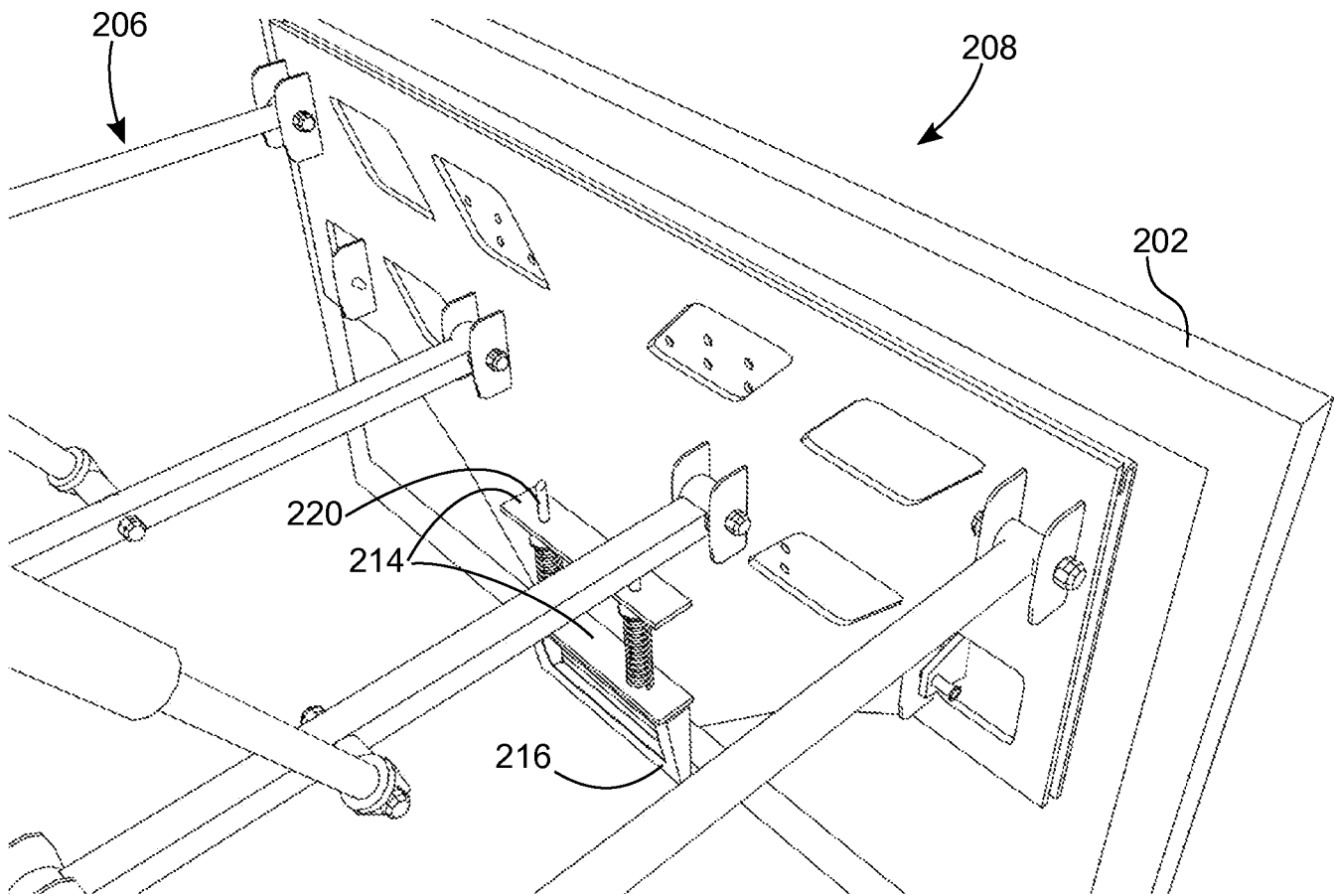


Fig. 16