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(54) **DISPLAY SCREEN MOUNTING DEVICE AND METHOD**

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(57) **ABSTRACT**

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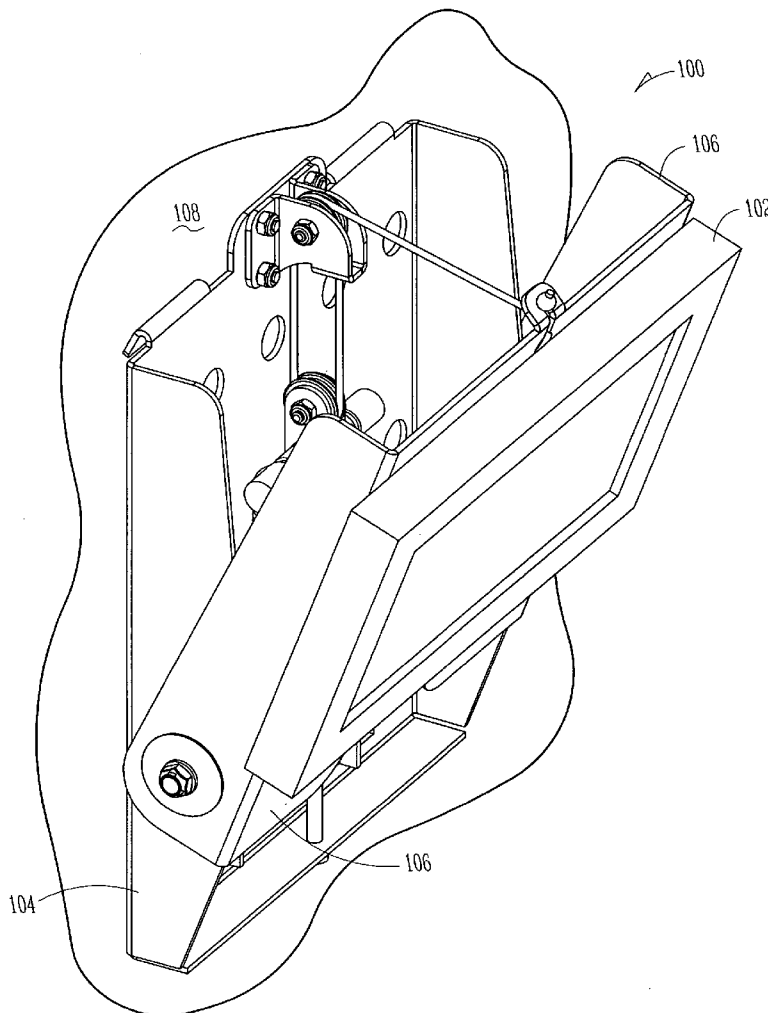
A display screen mounting device includes a device panel rotatably coupled to a mounting panel. A first portion of at least one elastic member is coupled to the mounting panel. A first pulley is rotatably coupled substantially adjacent to a second portion of the at least one elastic member, wherein the first pulley is moveable with the second portion of the at least one elastic member, and the flexible element is in rolling communication with the first pulley. In another example, a method for making a display screen tilt device includes rotatably coupling a device panel to a mounting panel. A first portion of an elastic member is coupled to the mounting panel and a second portion of the elastic member is coupled substantially adjacent to a first pulley. A flexible element, in rolling communication with the first pulley, is coupled between the mounting panel and the device panel.

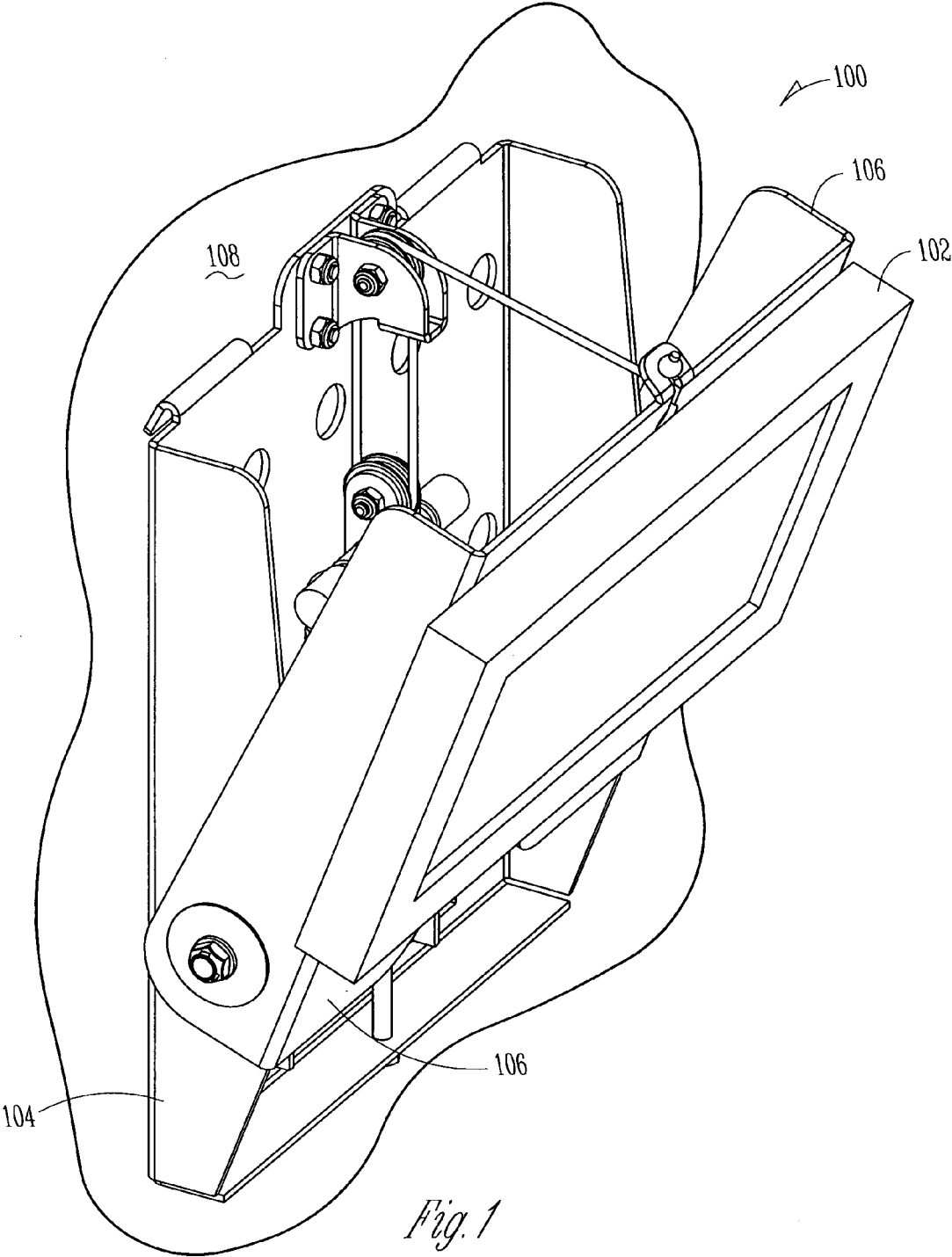
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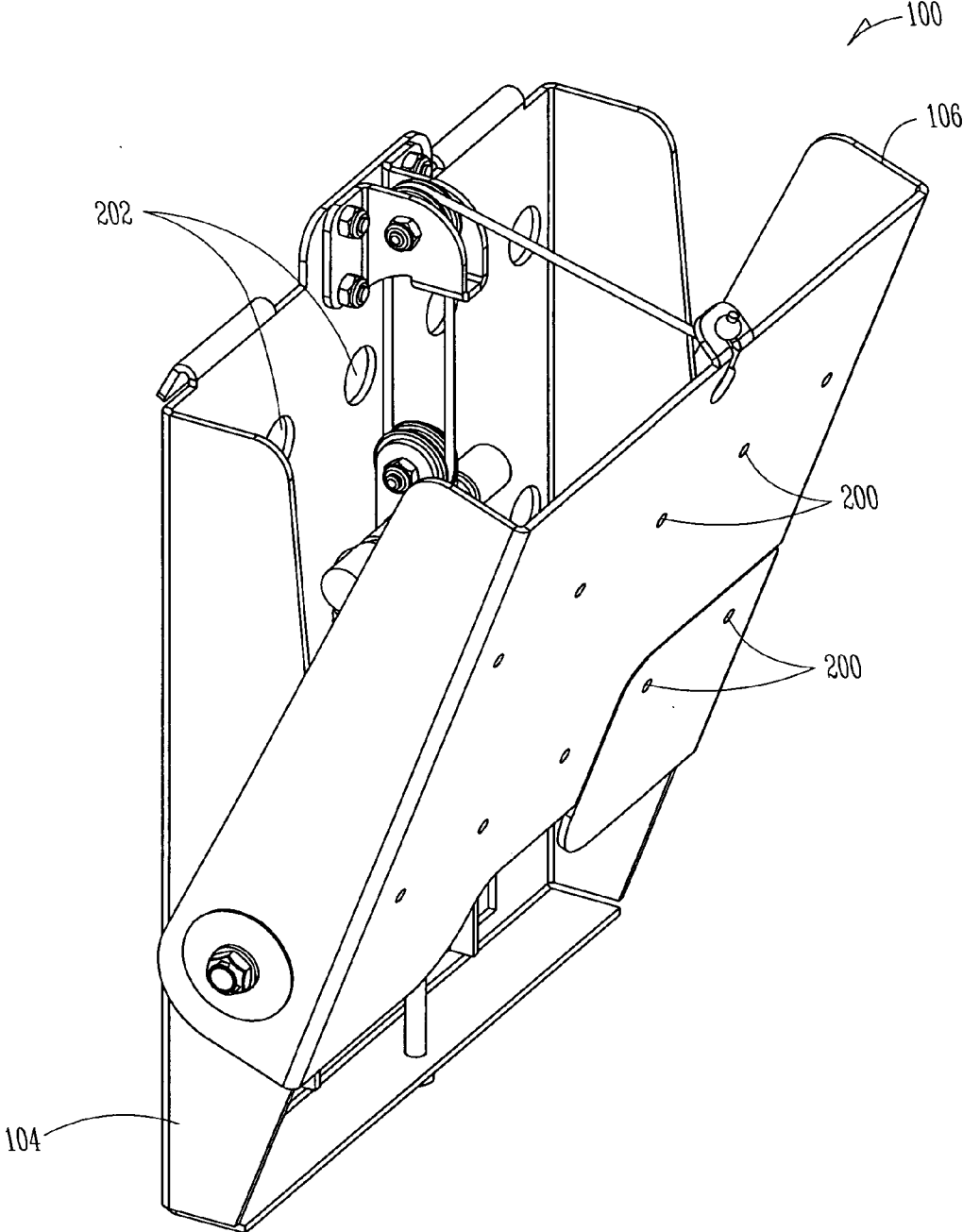
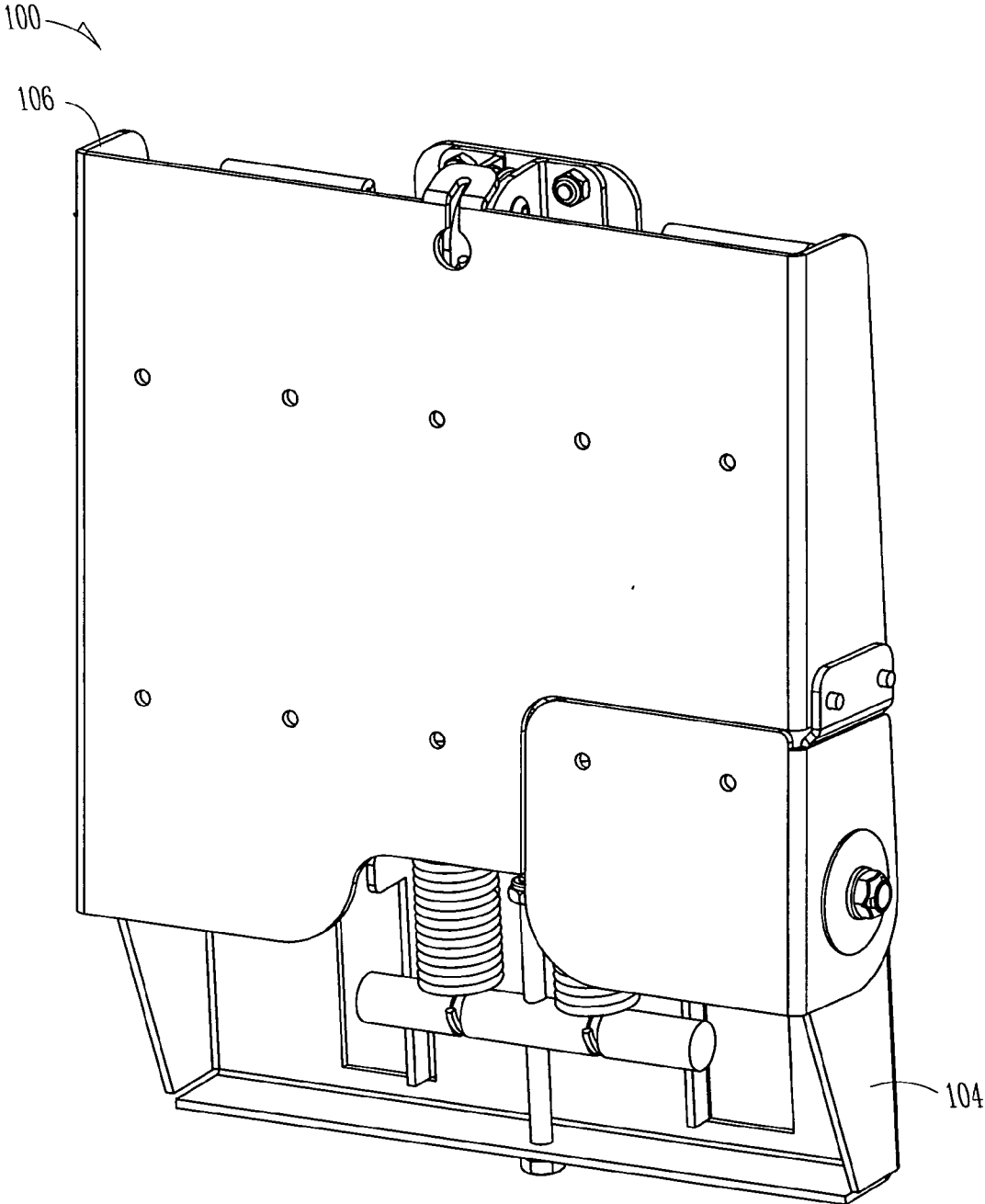


Fig. 2



*Fig. 3*

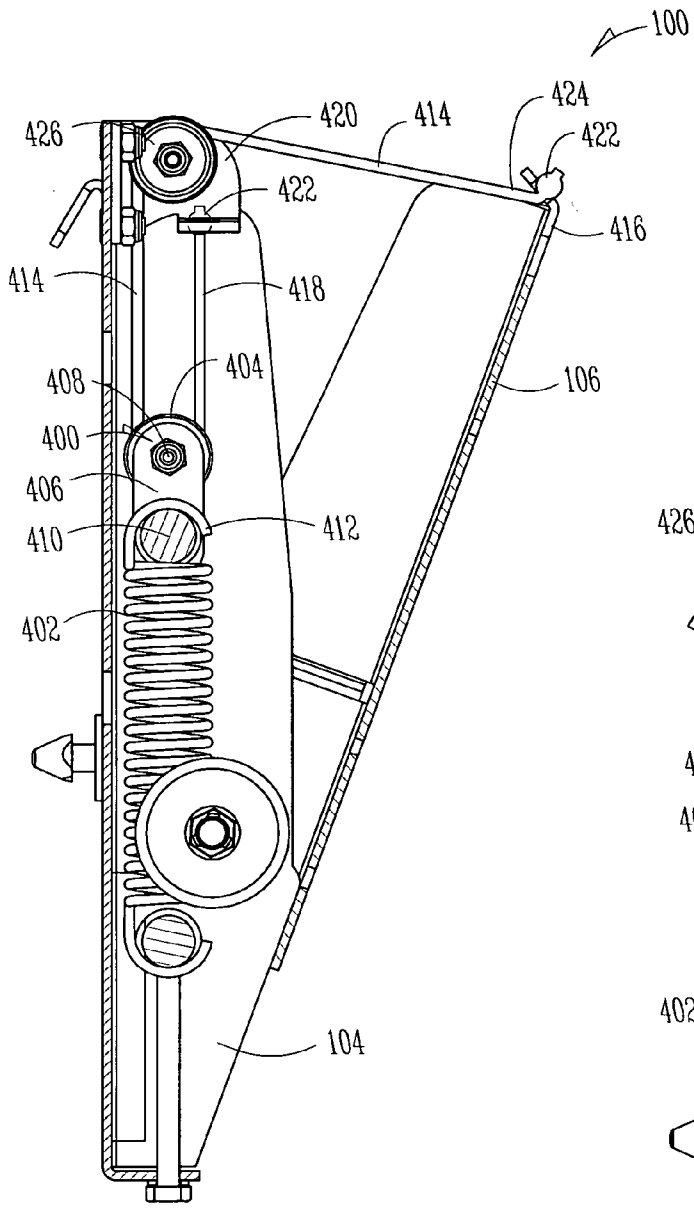


Fig. 4A

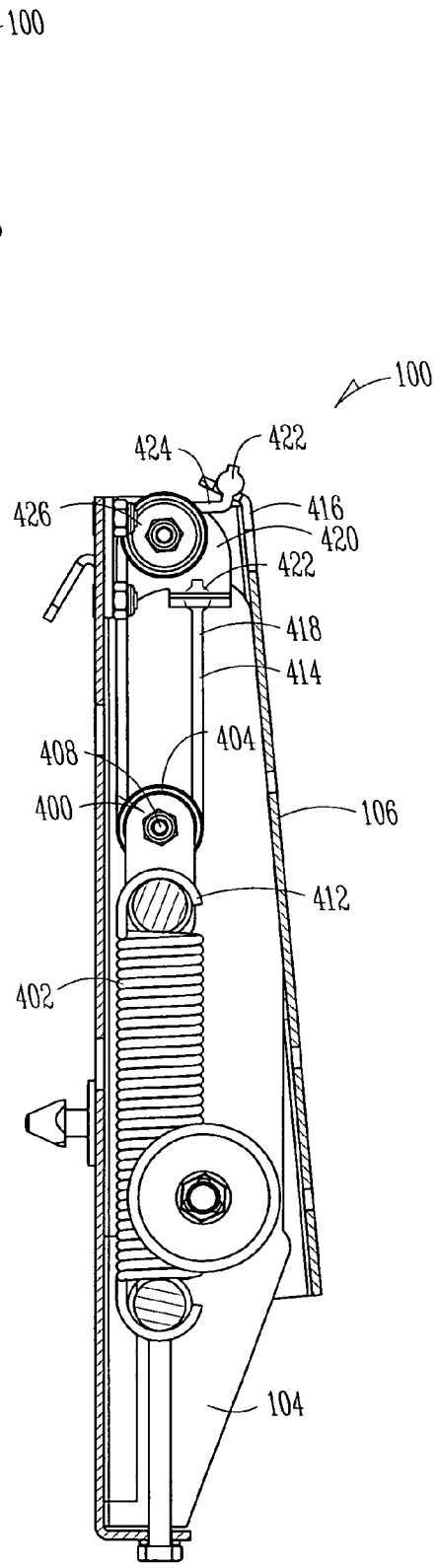


Fig. 4B

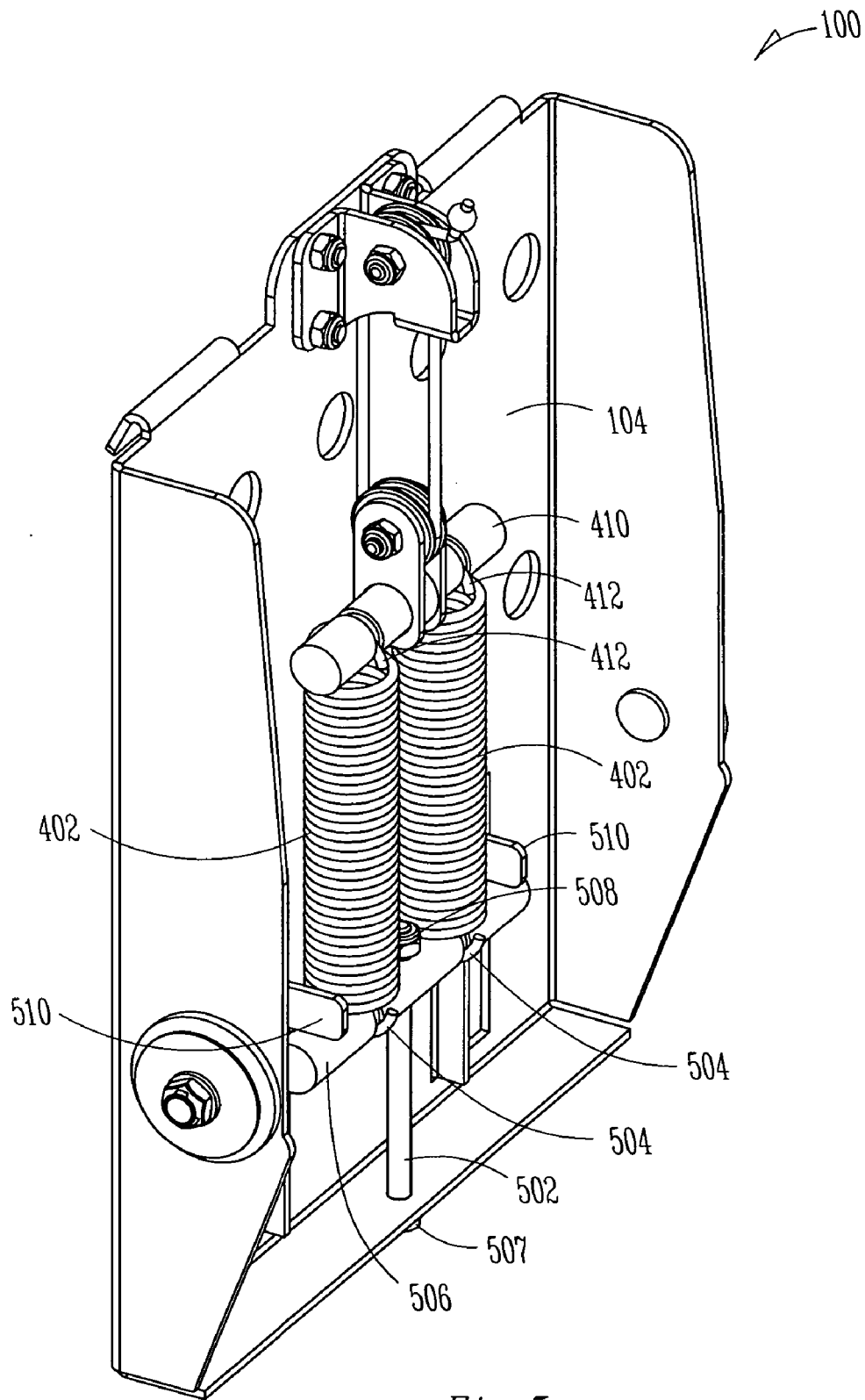
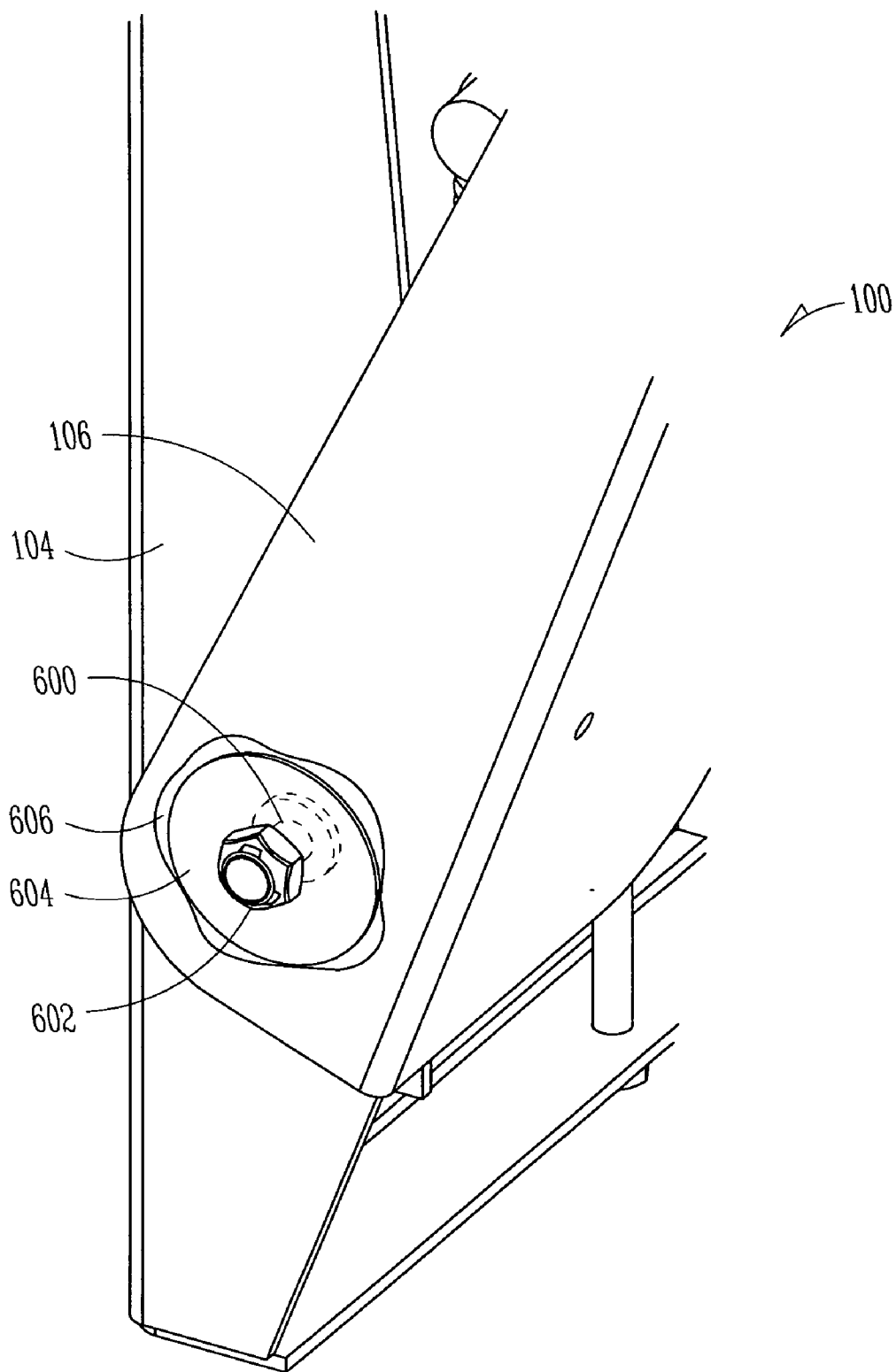


Fig. 5



*Fig. 6A*

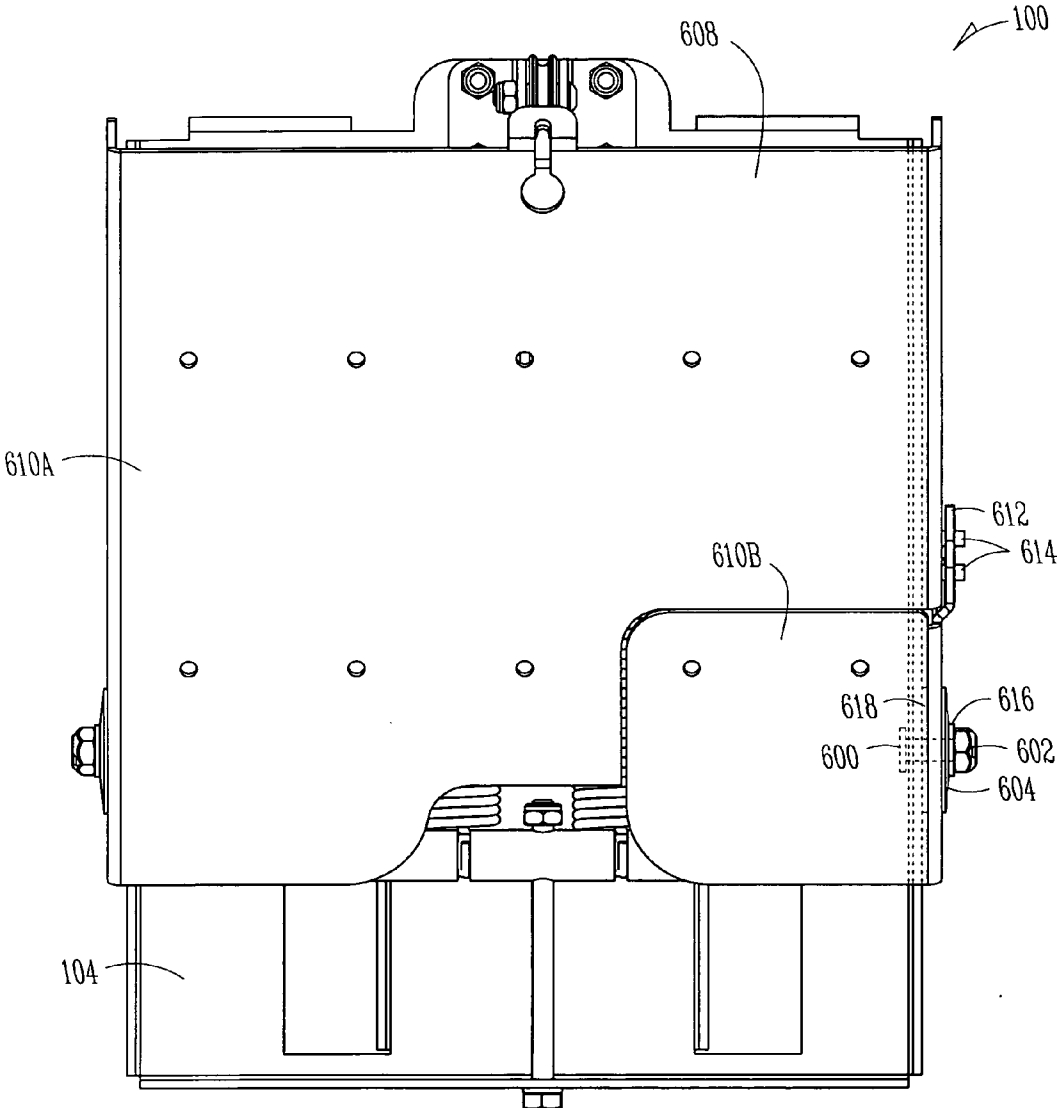


Fig. 6B



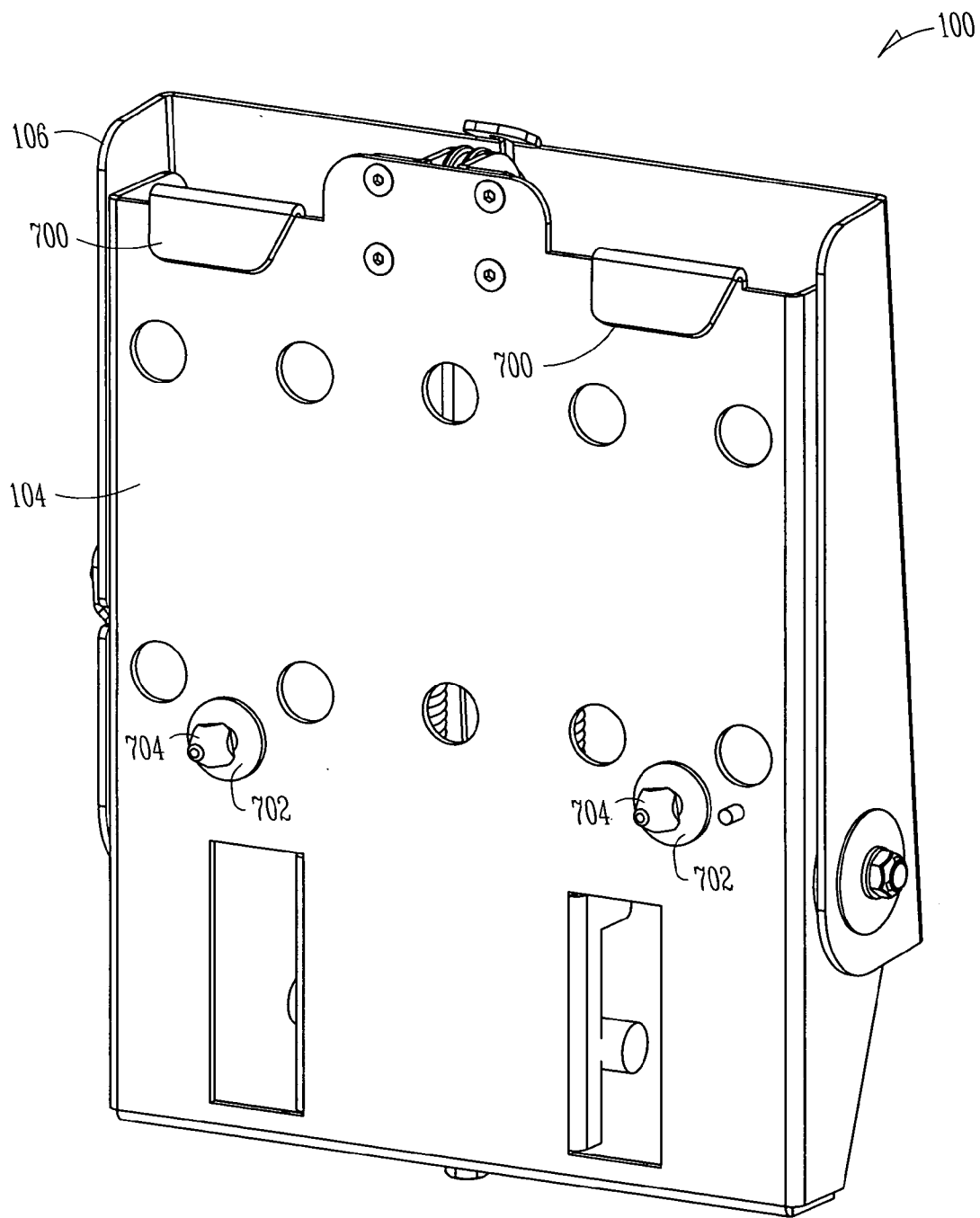


Fig. 7

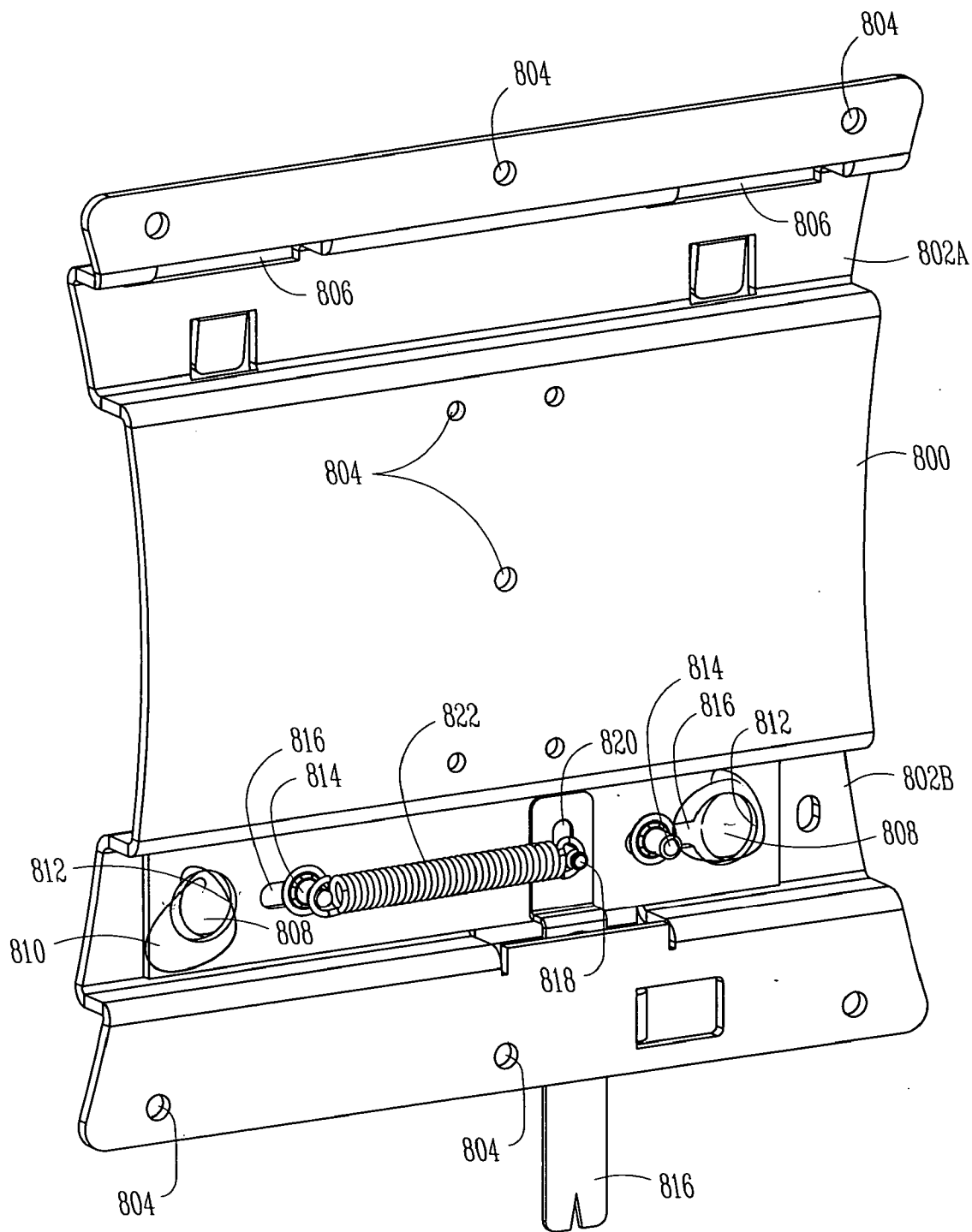
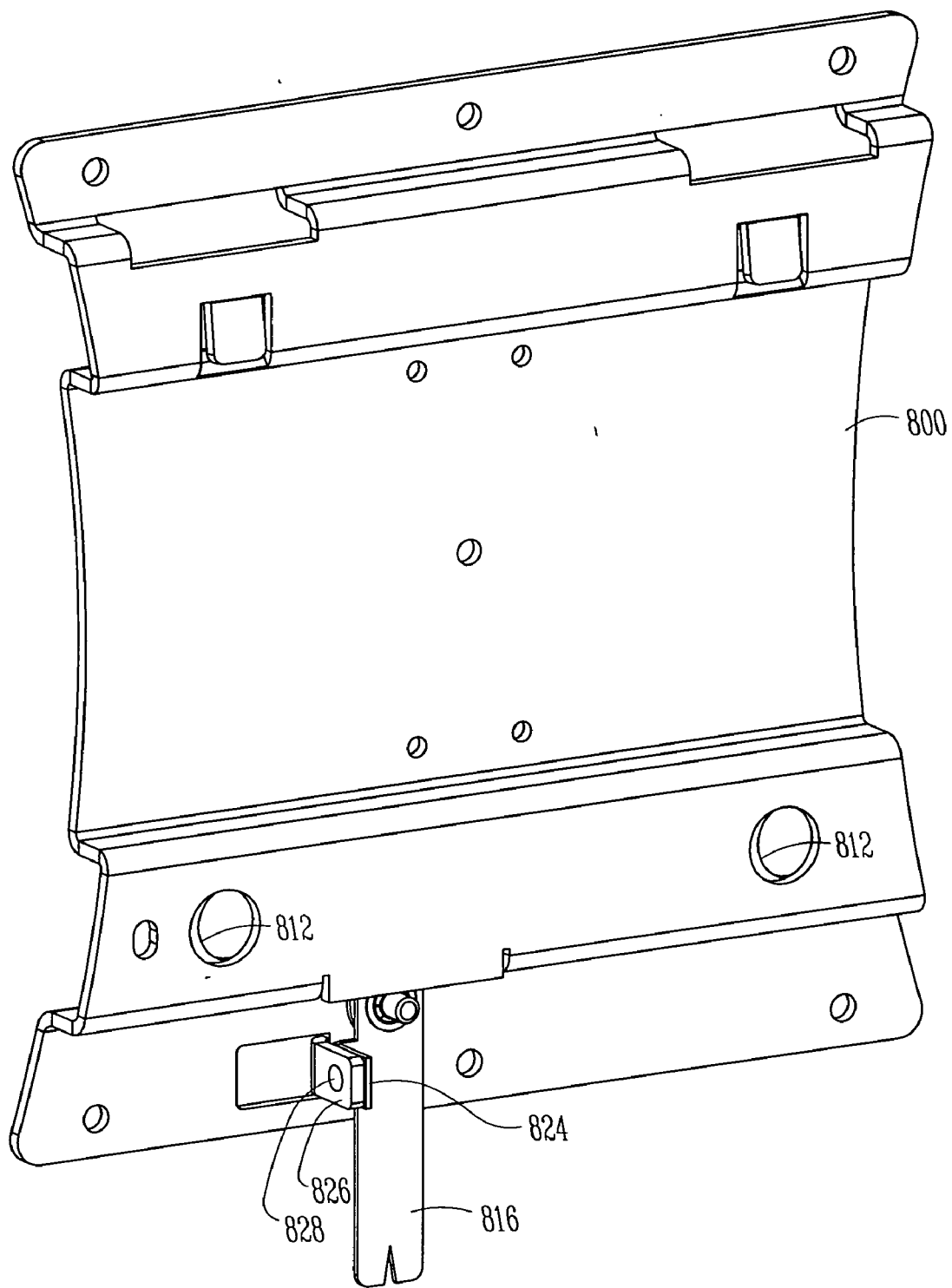


Fig. 8



*Fig. 9*

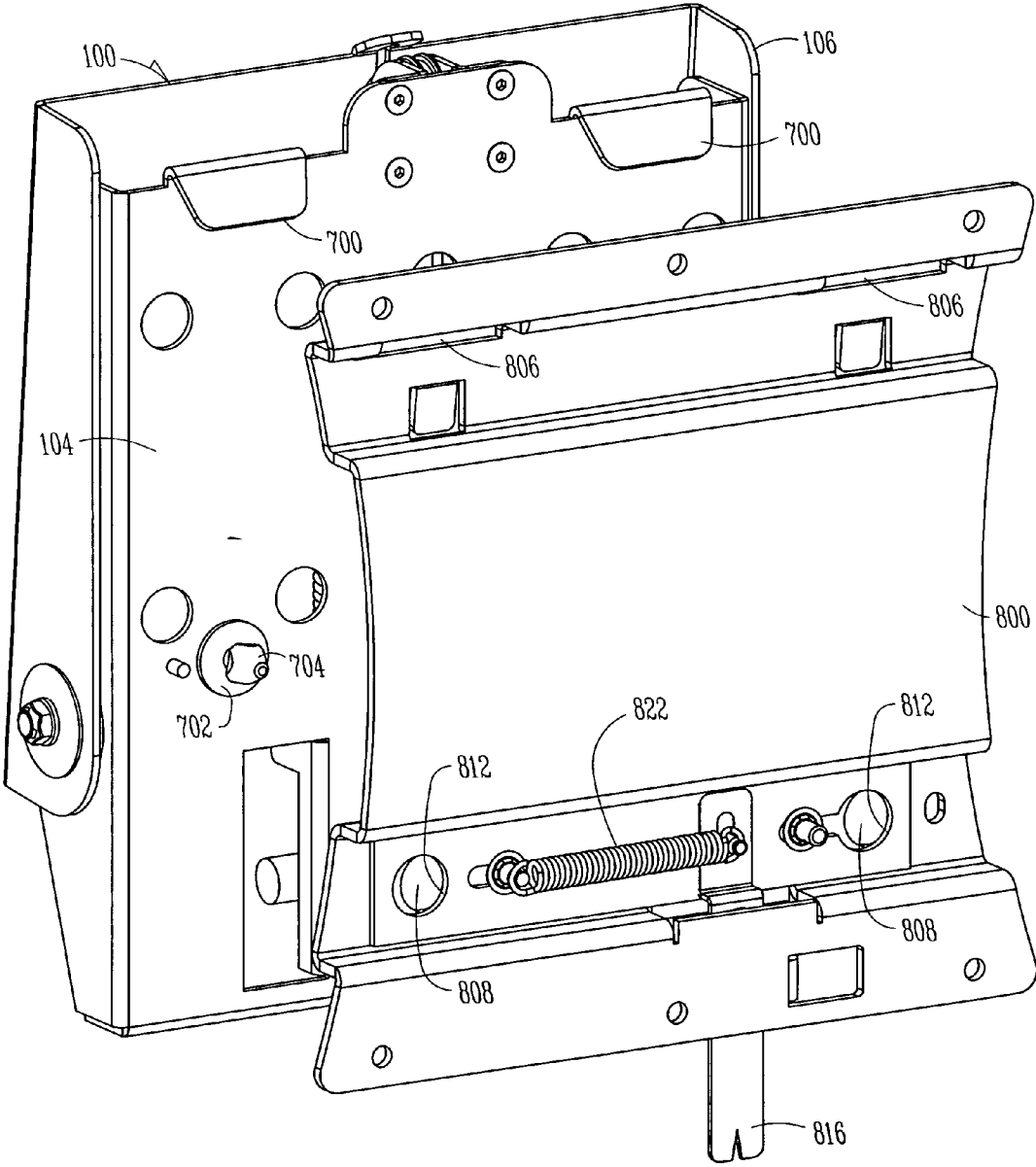
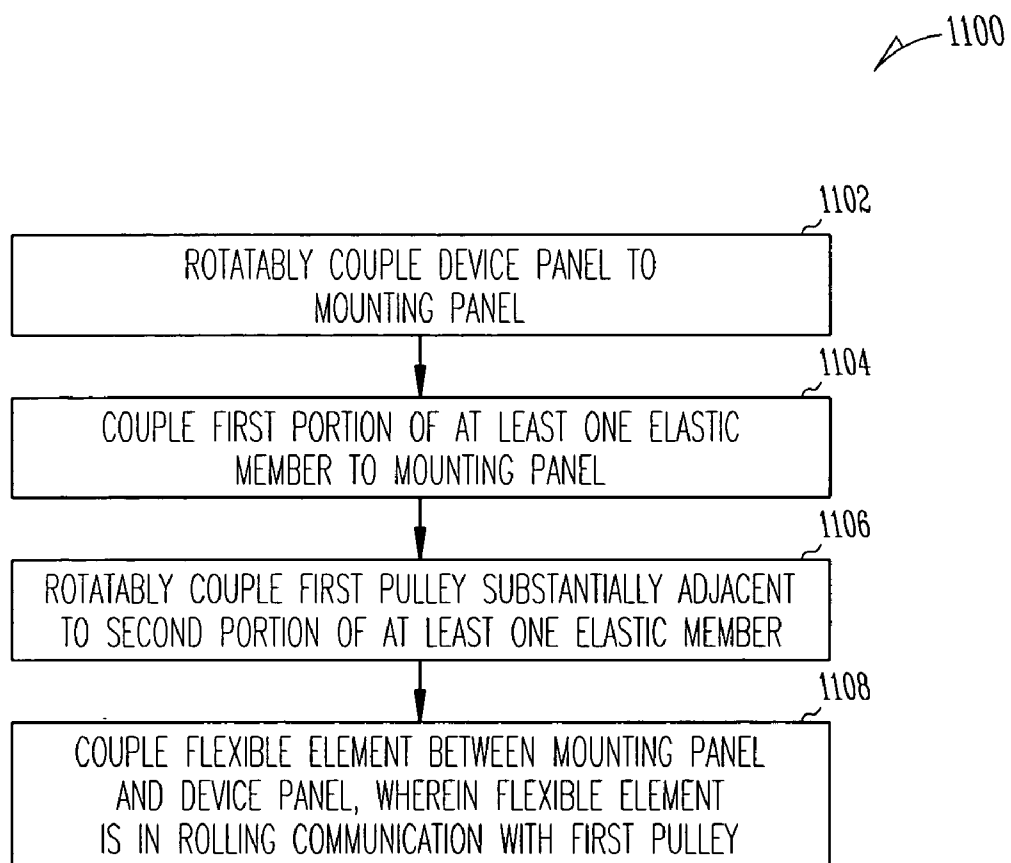


Fig. 10



*Fig. 11*

**DISPLAY SCREEN MOUNTING DEVICE AND METHOD**

**DETAILED DESCRIPTION**

**FIELD OF THE INVENTION**

[0001] Devices and methods for moveably supporting equipment including, but not limited to, flat panel display screens such as plasma screens, liquid crystal display screens, etc.

**BACKGROUND**

[0002] One common device that is mounted on a surface such as a wall includes a video display screen. Examples of video display screens include television monitors, computer monitors, information kiosks, etc. Display screens are commonly mounted on surfaces such as walls, ceilings, inclined surfaces, etc. Display screens are also mounted on other support structures such as poles or carts. A flat panel display is one type of display screen. Such flat panel displays include, LCD monitors, plasma discharge monitors, new configurations of CRT monitors, etc. Mounting systems are needed to secure these flat panel display screens to surfaces.

[0003] What is needed is a mounting system that moveably connects display screens to a surface. What is also needed is a compact mounting system that retains display screens in a desired orientation.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0004] FIG. 1 is a perspective view of one example of a mounting device supporting a display screen in an extended position.

[0005] FIG. 2 is a perspective view of another example of the mounting device in the extended position.

[0006] FIG. 3 is a perspective view of yet another example of the mounting device in a retracted position.

[0007] FIG. 4A is a cross-sectional view of yet another example of the mounting device in the extended position.

[0008] FIG. 4B is a cross-sectional view of yet another example of the mounting device in the retracted position.

[0009] FIG. 5 is a detailed view of one example of a mounting panel.

[0010] FIG. 6A is a detailed perspective view of one example of the mounting device.

[0011] FIG. 6B is a front view of another example of the mounting device.

[0012] FIG. 7 is a rear perspective view of one example of the mounting device.

[0013] FIG. 8 is a rear perspective view of one example of a surface bracket.

[0014] FIG. 9 is a perspective view of one example of the surface bracket.

[0015] FIG. 10 is an exploded view of one example of the surface bracket and the mounting device.

[0016] FIG. 11 is a block diagram of one example of a method for making a mounting device.

[0017] In the following detailed description, reference is made to the accompanying drawings which form a part hereof, and in which is shown, by way of illustration, specific embodiments in which the invention may be practiced. In the drawings, like numerals describe substantially similar components throughout the several views. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention. Other embodiments may be utilized and structural, logical changes, etc. may be made without departing from the scope of the present invention.

[0018] FIG. 1 shows a mounting device 100 and a display screen 102 coupled to the mounting device 100. In one example, the display screen 102 is a flat panel display, for instance, a plasma television, LCD display or the like. In another example, the display screen 102 is a CRT display, LCD projection display or the like.

[0019] As shown in FIGS. 1 and 2, the mounting device 100 includes a mounting panel 104 and a device panel 106 rotatably coupled to the mounting panel 104. The display screen 102 (FIG. 1) is coupled to the device panel 106, in one example with bolts or the like extending through the device panel 106 and coupled with the display screen 102. In another example, the display screen 102 is secured to the device panel 106 with bosses extending from the display screen 102 and secured within corresponding recesses in the device panel 106. Optionally, bosses extend from the device panel 106 are secured within recesses in the display screen 102. The device panel 106, in yet another example, includes the display screen 102 so the display screen 102 is rotatably coupled to the mounting panel 104.

[0020] In the orientation shown in FIG. 1, the device panel 106 and the display screen 102 are in an extended position. The device panel 106 and display screen 102 are tilted relative to the mounting panel 104. In one example, the mounting panel 104 is secured to a surface 108, such as a wall, ceiling, column or the like. The mounting panel 104, in another example, is positioned on the surface 108 above the eye level of viewers, for instance, adjacent to the ceiling in a room. In the extended position the display screen 102 is tilted and points generally toward the viewer's eye level.

[0021] The mounting device 100, including the mounting panel 104 and the device panel 106 are constructed from steel, in one example. In another example, the mounting device 100 includes, but is not limited to, plastic, wood or the like. The material of the mounting device 100 provides sufficient strength to support the display screen 102 upon the surface 108.

[0022] FIG. 2 shows one example of the device panel 106 in the extended position relative to the mounting panel 104. The device panel 106, in this example, includes openings 200 sized and shaped to receive pins, such as bolts, screws or the like to secure the display screen 102 (FIG. 1) to the device panel 106. The mounting panel 104 includes, in another example, mounting openings 202 sized and shaped to receive pins, for instance, bolts, screws or the like to secure the mounting device 100 to the surface 108 (FIG. 1). The mounting panel 104 optionally includes at least one hook and a dog (i.e., a projection) to secure the mounting device 100 to the surface 108, described below.

[0023] FIG. 3 shows the device panel 106 in a retracted position relative to the mounting panel 104. The device panel 106 is substantially parallel to the mounting panel 104. In another example, the device panel 106 is disposed along the mounting panel 104 in the retracted position. The device panel 106 is positionable in the retracted, extended and intermediate positions therebetween. In one example, the display screen 102 coupled to the device panel 106 (FIG. 1) is tilted with the device panel 106 into the retracted position. The mounting panel 104 is optionally coupled to the surface 108 (FIG. 1) at or adjacent to eye level and the display screen 102 points generally toward the eye level of the viewer. The mounting device 100 is thereby positionable at various locations on the surface 108 and the device panel 106 is adjustable so the display screen 102 points generally toward the eye level of the viewer.

[0024] FIG. 4A is a cross-sectional view showing the display panel 106 in the extended position relative to the mounting panel 104. The mounting device 100 includes an attenuating assembly 400 coupled to an elastic member 402. The elastic member 402, in one example, is coupled between the attenuating assembly 400 and the mounting panel 104. A first portion of the elastic member 402 (e.g., a first end) is coupled to the mounting panel 104 optionally with a tie bar and pretensioning member, described below. A second portion of the elastic member 402 (e.g., a second end) is coupled to the attenuating assembly 400. In another example, the elastic member 402 includes a coiled spring. The elastic member 402, in yet another example, is constructed with a pliable elastomeric material (e.g. a rubber member) coupled between the mounting panel 104 and the attenuating assembly 400. The elastic member 402 operates to counterbalance the weight of the display screen 102 (FIG. 1) on the display panel 106 and assists in retaining the display screen 102 and panel 106 in a desired tilted orientation.

[0025] In the example shown in FIGS. 4A, the attenuating assembly 400 includes a first pulley 404 rotatably coupled to the elastic member 402. In one example, a bridge bracket 406 is coupled between the elastic member 402 and the first pulley 404. The bridge bracket 406 couples the first pulley 404 to the elastic member 402. In another example, the first pulley 404 is rotatably coupled to the bridge bracket 406 with a pin 408. The pin 408 extends through the first pulley 404 and is secured to the bridge bracket 406. In yet another example, the bridge bracket 406 includes a shaft 410 extending from the bridge bracket 406. The elastic member 402 includes, optionally, a hook 412 sized and shaped to fit over the shaft 410 and couple the elastic member 402 to the bridge bracket 406 and the first pulley 404.

[0026] As shown in FIGS. 4A and 4B, the attenuating assembly 400 includes a flexible element 414, such as a cable, strap, belt or the like coupled between a distal end 416 of the display panel 106 and the mounting panel 104. One portion 418 of the flexible element 414, in an example, is coupled to a bracket 420 extending from the mounting panel 104. In one example, the flexible element 414 extends through a portion of the bracket 420 and a bead 422 is formed around the portion 418 of the flexible element 414. The bead 422 enlarges the outer perimeter of the portion 418 of the flexible element 414 and prevents the flexible element 414 from disengaging with the mounting panel 104. Another portion 424 of the flexible element 414 extends through the distal end 416 of the display panel 106. A similar bead 422

is formed on the portion 424 of the flexible element 414 to secure the flexible element 414 to the distal end 416. The beads 422 are formed around the flexible element 414, for instance, by swaging, molding, crimping, adhering or the like.

[0027] The flexible element 414 extends from the bracket 420 around the first pulley 404, around the bracket 420, and couples with the display panel 106. In one example, a second pulley 426 is rotatably coupled to the bracket 420. The second pulley 426 facilitates movement of the flexible element 414 between the display panel 104 and the mounting panel 106. The second pulley 426 ensures the elastic member 402 maintains a substantially parallel orientation with respect to the mounting panel 104. Maintaining the elastic member 402 in the parallel orientation allows the elastic member 402 to expand and contract along the mounting panel 104 and not interfere with the tilting movement of the display panel 106 relative to the mounting panel 104. Additionally, the elastic member 402 and attenuating assembly 400 are positioned adjacent to the mounting panel 104 so the mounting device 100 presents a narrow profile. Optionally, the second pulley 426 is omitted and the mounting panel 104, for instance, the bracket 420 is sized and shaped to slidably couple with the flexible element 414. The bracket 420 maintains the elastic member 402 in the parallel orientation in a similar manner to the second pulley 426.

[0028] In the example shown in FIGS. 4A and 4B, the flexible element 414 is in rolling communication with the first pulley 404 and the second pulley 426. The flexible element 414 extends around the first pulley 404 and the second pulley and is coupled to the display panel 106. Movement of the display panel 106, for example, during positioning of a display screen 102 (FIG. 1) correspondingly moves the flexible element 414. Where the display panel 106 is moved between the extended position (FIG. 4A) and the retracted position (FIG. 4B) the elastic member 402 contracts and pulls the flexible element 414 over the first pulley 404 substantially parallel to the mounting panel 104. The flexible element 414 and the elastic member 402 thus move along the mounting panel 104 during movement of the display panel 106. The elastic member 402 and the attenuating assembly 400 are thereby compactly positioned adjacent to the mounting panel 104. Movement of the first pulley 404 through tilting of the display panel 106 contracts the elastic member 402 and decreases the tension in the flexible element 414. The tension in the flexible element 414, at least in part, counterbalances the moment of the display screen 102 (FIG. 1) and substantially prevents undesirable movement of the display panel 106 after the display screen 102 is positioned as desired. As the display panel 106 is moved toward the mounting panel 104 the moment arm of the display screen 102 is decreased and the attenuating assembly 400 cooperates with the elastic member 402 to correspondingly decrease the tension in the flexible element 414.

[0029] When the display panel 106 is moved from the retracted position (FIG. 4B) to the extended position (FIG. 4A), the flexible element 414 is correspondingly pulled along with the display panel 106. The flexible element 414 is pulled over the first pulley 404 and the first pulley 404 and the portion of the elastic member 402 coupled to the first pulley are moved along the mounting panel 104 toward the second pulley 426. Movement of the first pulley 404 through tilting of the display panel 106 stretches the elastic member

**402** and increases the tension in the flexible element **414**. The tension in the flexible element **414**, at least in part, counterbalances the moment of the display screen **102** (FIG. 1) and substantially prevents undesirable movement of the display panel **106** after the display screen **102** is positioned as desired. As the moment arm of the display screen **102** increases with extension of the display panel **106** the attenuating assembly **400** cooperates with the elastic member **402** to correspondingly increase the tension in the flexible element **114**.

[0030] The flexible element **414** has a sufficient length to permit motion of the display panel **106** relative to the mounting panel **104** through a desired range of motion, for instance, 0 to 45 degrees measured from the mounting panel **104**. In one example, the flexible element **414** of the attenuating assembly **400** is sized and shaped to attenuate the tension in the elastic member **402**. In another example, the tension is attenuated by splitting the tension between the portion of the flexible element **414** extending from the first pulley **404** to the bracket **420** and the portion extending from the first pulley **404** to the display panel **106**. The elastic member **402** and the flexible element **414** are sized and shaped to moveably position the first pulley **404** along the flexible element **414**, in yet another example, to attenuate the tension in the elastic member **402**. Attenuation of the tension in the elastic member **402** with the attenuating assembly **400** substantially prevents undesirable moving of the display panel **106** toward the mounting panel **104** from a desired orientation. Additionally, the flexible element **414** has sufficient length and the first pulley **404** is positioned along the flexible element **414** to substantially prevent the display panel **106** and display screen **102** (FIG. 1) from undesirably tilting away from the mounting panel **104** and the desired orientation.

[0031] In another example, the attenuating assembly **400** shortens the travel of the elastic member **402** adjacent to the first pulley **404** during rotation of the display panel **106** relative to the mounting panel **104**. Rotation of the display panel **106** translates into movement of the flexible element **114**. The flexible element moves over the first pulley **404** and the first pulley is translated a fraction of the distance (e.g., one half the distance) translated by the flexible element **114** because of the relationship between the pulley **404** and the element **114**. Without the attenuating assembly **400**, the length of the display panel **106** travel and the corresponding arc is limited by the identical length of travel for the elastic member **402**. As a result of the attenuating assembly **400**, the display panel **106** is moveable through a larger arc because the elastic member **402** moves a fraction of the distance of the flexible element **114** moving with rotation of the display panel **106**. In one example, the display panel **106** experiences increased displacement relative to the mounting panel **104** for a given extension of the elastic member **402**.

[0032] FIG. 5 shows the mounting device **100** including a pretensioning member **502** coupled between the mounting panel **104** and at least one elastic member **402**. In the example shown, the pretensioning member **502** is coupled between the mounting panel **104** and two elastic members **402**. As shown in FIG. 5, first portions (e.g. ends) of the elastic members **402** include hooks **504** sized and shaped to fit over a tie bar **506**. The hooks **412**, **504** cooperate to couple the elastic member **402** between the shaft **410** and the tie bar **506**. The tie bar **506** is sized and shaped to moveably couple

with the pretensioning member **502**. In one example, the pretensioning member **502** includes threading and the tie bar **506** includes corresponding threading along an inner surface coupled to the pretensioning member **502**. The tie bar **506** extends from the pretensioning member **502** and the elastic members **402** are coupled to the tie bar **506** adjacent to the pretensioning member **502**. In another example, the pretensioning member **502** includes a skirt **508**, such as a nut, weld, flange or the like at one end of the pretensioning member **502**. The skirt **508** is sized and shaped to engage against the tie bar **506** and prevent the tie bar **506** from disengaging from the pretensioning member **502**.

[0033] The pretensioning member **502**, in one example, is turned to translate the tie bar **506** along the member **502**. The pretensioning member **502** includes, in another example, a grip **507** (e.g. hex head, hand grip, or the like) sized and shaped to facilitate rotation of the member **502**. The threading of the tie bar **506** and the pretensioning member **502** cooperate so rotation of the member **502** correspondingly moves the tie bar **506**. Translation of the tie bar **506** along the pretensioning member **502** correspondingly expands or contracts the elastic members **402** and thereby pretensions the elastic members **402** as desired for a particular load, for example, the particular weight of a display screen (FIG. 1). Use of both the pretensioning member **502** and the attenuating assembly **400** allows for operation of the mounting device **100** with a variety of display screens having different weights and correspondingly different moments. For heavier display screens **102** (FIG. 1), the tie bar **506** can be translated along the pretensioning member **502** away from the skirt **508** to increase the tension in the elastic members **402**. Conversely, for lighter display screens **102** (FIG. 1), the tie bar **506** can be translated toward the skirt **508** to decrease the tension in the elastic members **402**. In one example, the mounting panel **104** includes at least one flange **510**. As shown in FIG. 5, two flanges **510** extend from the mounting panel **104**. The flanges **510** extend from the mounting panel and into the path of travel for the tie bar **506**. The flanges **510** operate to limit the translation of the tie bar **506** and ensure the elastic members **402** have a sufficient tension to counterbalance the weight of the display screen **102** (FIG. 1).

[0034] FIG. 6A shows the display panel **106** coupled to the mounting panel **104**. In the example shown, a pin **600** extends between the display panel **106** and the mounting panel **104**. In one example, the pin **600** is a bolt, screw or the like sized and shaped to extend through the mounting panel **104** and the display panel **106**. The pin **600**, in another example, includes threading to engage with a nut **602** to facilitate a secure coupling between the mounting panel **104** and the display panel **106**. The pin **600** optionally extends from the display panel **106**. The pin **600**, in one example, is welded or integral to the mounting panel **104**.

[0035] A washer **604** is interposed between the nut **602** and one of the mounting panel **104** and the display panel **106**. The washer **604** is engaged against the nut **602** and one of the mounting panel **104** and the display panel **106**. In one example, the washer **604**, nut **602** and pin **600** cooperate to snugly couple the mounting panel **104** to the device panel **106**. The snug coupling therebetween provides a frictional fitting between the mounting panel **104** and the device panel **106** and assists in preventing unwanted movement of the display panel **106** when positioned as desired (e.g., where



the display screen 102 (FIG. 1) points toward eye level). The washer 604 is provided, in another example, to prevent tilting of the display panel 106 from turning the nut 602 and loosening and/or removing the nut 602 from the pin 600. The washer, optionally, is constructed with, but not limited to, a material with a low coefficient of friction, for instance polytetrafluoroethylene. In another option, a lubricious coating 606 is between the washer 604 and one of the mounting panel 104 and the display panel 106. Optionally, the lubricious coating 606 is between the washer 604 and the nut 602. The lubricious coating 606 facilitates sliding movement between the washer 604 and the surfaces against which the washer 604 is engaged (i.e. the nut 602, mounting panel 104, display panel 106). The lubricious coating includes liquid and/or solid lubricants, for instance, molybdenum disulfide, graphite, polytetrafluoroethylene or the like. In one example, the washer 604 includes a material having pores formed therein such as bronze and the lubricious coating is retained within the pores.

[0036] FIG. 6B shows another example of a display panel 608 coupled to the mounting panel 104. In the example shown, the display panel 608 includes a first piece 610A extending across the mounting panel 104 and a second piece 610B coupled between one side of the mounting panel 104 and the first piece 610A. A bracket 612, in one example is coupled between the first and second pieces 610A, 610B. The bracket 612 is integral to the second piece 610B, optionally. Pins 614, screws, bolts, rivets, studs or the like extend through the bracket 612 and engage against the first piece 610A to couple the first piece 610A to the second piece 610B. The second piece 610B is moveably coupled to the first piece 610A with the bracket 614 to ensure proper clearance for rotation between the display panel 608 and the mounting panel 104. The first and second pieces 610A, 610B are separately coupled to the mounting panel 104 and the bracket 612 is then coupled between the pieces 610A, 610B. Assembling the first and second pieces 610A, 610B in this manner provides sufficient clearance between the display panel 608 and the mounting panel 104 to permit rotation therebetween. Additionally, providing the second piece 610B separately from the first piece 610A facilitates assembly of the mounting device 100 by allowing alignment of the pin holes between the mounting panel 104 and the first and second pieces 610A, 610B separately. The second piece 610B, optionally, is then easily coupled to the first piece 610A with the bracket 612 afterwards. With the single piece construction for the display panel 106 both pin holes are aligned with the corresponding holes in the mounting panel 104 in a single step to assemble the mounting device 100.

[0037] Referring again to FIG. 6B, the pin 600 extends between the display panel 608 and the mounting panel 104. In one example, the pin 600 is a bolt, screw or the like sized and shaped to extend through the mounting panel 104 and the display panel 608. The pin 600, in another example, includes threading to engage with the nut 602 to facilitate a secure coupling between the mounting panel 104 and the display panel 608. A washer 604, such as a spring washer, is interposed between the nut 602 and one of the mounting panel 104 and the display panel 608. In one example, the washer 604 is interposed between the nut 602 and the display panel 608. The washer 604 provides a biasing force that pulls the pin 600, including the head of the pin into engagement with the mounting panel 104 and presses the mounting panel 104 toward the display panel 608. In another

example, a lubricious washer 616 is interposed between the washer 604 and the nut 602. The lubricious washer 616 is constructed with, but not limited to, a porous bronze in example. The pores of the washer 616 are filled with liquid and/or solid lubricants, for instance, molybdenum disulfide, graphite, polytetrafluoroethylene or the like. The lubricants facilitate sliding movement between the lubricious washer 616 and the surfaces against which the washer 616 is engaged (i.e. the nut 602 and the washer 604). The lubricious washer 616 is provided to prevent tilting of the display panel 608 from turning the nut 602 and loosening and/or removing the nut 602 from the pin 600.

[0038] A second washer 618 is provided, in one example, between the mounting panel 104 and the display panel 608. The second washer 618 is sized and shaped to span a gap between the mounting panel 104 and the display panel 608 to ensure a snug coupling therebetween. The snug coupling provides friction between the mounting panel 104 and the display panel 608 and assists in preventing unwanted movement of the display panel 608 when positioned as desired (e.g., where the display screen 102 (FIG. 1) points toward eye level). In another example, the washer 604 is a spring washer and provides tension to the pin 600 snugly couple second washer 618 between the mounting panel 104 and the display panel 608 to provide friction therebetween.

[0039] FIG. 7 is a rear perspective view of the mounting device 100. The mounting panel 104 includes, in one example, at least one fastener 700, such as a hook or the like. As shown in FIG. 7, two fasteners 700 extend from the mounting panel 104. The fastener 700 is sized and shaped to engage against, for instance, the surface 108 (FIG. 1) and secure the mounting device 100 to the surface 108. In another example, the fastener 700 is sized and shaped to engage against a surface bracket (described below). The fastener 700 is optionally disposed within an opening in the surface (e.g., a hole in a wall) to hang the mounting device 100 on the surface 108. The fastener 700 is integral to the mounting panel 104, in another example. In yet another example, the fastener is coupled to the mounting panel 104, such as by welding, bolting or the like.

[0040] At least one dog 702, for instance a projection, flange or the like, extends from the mounting panel 104 in another example. In the example shown in FIG. 7, two dogs 702 extend from the mounting panel 104. The dog 702 is sized and shaped to fit within an opening in the surface 108 (FIG. 1), in one example. In another example, the dog 702 is sized and shaped to couple with a surface bracket (described below) to retain the mounting device 100 against the surface 108. The dog 702 includes a lip 704 optionally for engagement with a detent surface (described below). The dog 702 assists in distributing the weight of the mounting device 100 otherwise carried by the fastener 700. The dog 702 cooperates with the fastener 700 to substantially prevent accidental disengagement of the mounting device 100 from the surface 108. For example, force applied to the device panel 106 to rotate the panel 106 toward the mounting panel 104 is transmitted to the mounting panel 104 and moves the mounting panel 104 up along the surface 108 (FIG. 1). Sufficient force will move the fastener 700 out of engagement with the surface 108 and undesirably uncouple the mounting device 100 from the surface 108. Disengagement of the mounting device 100 in this manner is a concern as the mounting device 100 can unintentionally fall from the

surface 108. Additionally, the display screen 102 (FIG. 1) could be damaged with an unintended disengagement and fall with the mounting device 100.

[0041] The dog 702 remains engaged against the surface 108 with movement of the device panel 106. The dog 702, in one example, extends substantially orthogonal to the mounting panel 104 and thereby remains engaged against the perimeter defining the opening in the surface 108 despite movement of the display panel 106. In another example, the cooperative engagement of the fastener 700 and dog 702 to the surface 108 allows for safe disengagement of the mounting device 100 from the surface 108. The mounting panel 104 is pulled near a lower edge to rotate the panel 104 around the fastener 700. The dog 702 disengages from the surface 108 and the fastener 700 is disengaged from the surface 108 by pulling the mounting panel 104 away from the surface 108.

[0042] FIG. 8 is a rear perspective view of a surface bracket 800 for coupling the mounting panel 104 to the surface 108 (FIG. 1), in one example. The surface bracket 800, includes corrugations 802A, 802B. Openings 804, in another example, are disposed around the surface bracket 800 and on either side of the corrugations 802A, 802B. The openings 804 are sized and shaped to receive pins, screws, bolts or the like to couple the surface bracket 800 to surface 108 (FIG. 1). The fasteners 700 (FIG. 7) are received within cavities 806 in the corrugation 802A so the mounting panel 104 is hung from the surface bracket 800. Corrugation 802B includes apertures 808 sized and shaped to receive the dogs 702 extending from the mounting panel 104 (FIG. 7). A moveable member 810 with detent surfaces 812 is slidably coupled to the surface bracket 800 and disposed within the corrugation 802B. Pins 814 extend from the corrugation and through slots 816 of the moveable member 810 so the member 810 moves around the pins 814. The pins 814 include flanges for securing the moveable member 810 around the pins and thereby slidably coupled to the corrugation 802B.

[0043] An actuator lever 816 is moveably coupled to the surface bracket 800 and rotatably coupled substantially adjacent to one end of the lever 816 to the moveable member 810, in one option. A pin 818, for example, extends from the moveable member 810 and is received within a channel 820 in the actuator lever 816. Movement of the actuator lever 816 is transmitted to the moveable member 810 and correspondingly moves the detent surfaces 812. In one example, the actuator lever 816 moves the detent surface 812 into and/or out of engagement with the dog 702 (FIG. 7). Optionally, a biasing member 822, such as a spring or the like, is coupled between the pin 818 and the pin 814. The biasing member 822 is pretensioned and acts to pull the moveable member 810 and detent surface 812 into engagement with the dogs 702.

[0044] FIG. 9 is a front perspective view of the surface bracket 800. The actuator lever 816, in one example, is shown rotatably coupled to the surface bracket 800 by a fastener 823, such as a pin, screw or the like. The detent surfaces 812 are shown extending over a portion of the apertures 808. In this position, a first flange 824 of the actuator lever 816 is substantially adjacent to a second flange 826 extending from the surface bracket 800. The first flange 824 and the second flange 826 optionally include an

opening 828 extending therethrough. A bolt, screw, pin or the like is placed within the opening 828 to couple the first flange 824 with the second flange 826. In one example, a bolt is tightened around the first and second flanges 824, 826 to secure the actuator lever 816 and prevent unwanted movement of the lever 816 that may cause, for instance, disengagement of the detent surfaces 812 from the dogs 702.

[0045] FIG. 10 is an exploded view of the surface bracket 800 and the mounting device 100. In one example, the surface bracket 800 is coupled to the surface 108 (FIG. 1). To couple the mounting panel 104 to the surface bracket 800 the fasteners 700 are seated within the cavities 806. The mounting panel 104 is engaged against the surface bracket 800 so the dogs 702 are at least partially disposed within the apertures 808. As shown in FIG. 10, the biasing member 822 operates to pull the moveable member 810 so the detent surfaces 812 overlay at least a portion of the apertures 808. The lips 704 of the dogs 702 engage against the detent surfaces 812 and the surfaces defining the apertures 808. In one example, pressure applied to the mounting device 100 toward the surface bracket 800 pushes the dogs 702 further into the apertures 808 and correspondingly moves the detent surfaces 812 aside to allow entry of the dogs 702. Once the lips 704 move beyond the detent surfaces 812, the detent surfaces 812 move back through force applied by the biasing member 822. The detent surfaces 812 partially overlay the apertures 808 to prevent the dogs 702, that have larger profiles than the partially occluded apertures 808, from moving out of the apertures 808. The lips 704 are engaged against the moveable member 810 and the mounting panel 104 is securely coupled to the surface bracket 800. In another example, the actuator lever 816 is moved to correspondingly move the detent surfaces 812 to allow the dogs 702 and lips 704 to move through the apertures 808. The actuator lever 816 is released so the detent surfaces 812 overlay the apertures 808 and prevent the dogs 702 from moving out of the apertures 808. As a result, the mounting panel 104 is securely coupled to the surface bracket 800. To uncouple the mounting device 100 from the surface bracket 800 the operation described above is substantially repeated in reverse order.

[0046] FIG. 11 is a block diagram illustrating a method 1100 for making a mounting device. One example of a mounting device (i.e. mounting device 100) is shown in FIGS. 4A and 4B, and is referred to below. At 1102, a device panel 106 is rotatably coupled to a mounting panel 104. In one example, the device panel 106 is coupled to the mounting panel with a pin 600 (FIG. 6) extending therebetween. At 1104, a first portion of at least one elastic member 402 is coupled to the mounting panel 104. The elastic member 402, in one example, includes at least one coiled spring. At 1106, a first pulley 404 is rotatably coupled substantially adjacent to a second portion of the at least one elastic member 402. In one example, a bridge bracket 406 is coupled between the first pulley 404 and the second portion of the at least one elastic member 402. At 1108, a flexible element 414 is coupled between the mounting panel 104 and the device panel 106. The flexible element 414 is in rolling communication with the first pulley 404. In one example a second pulley 426 is rotatably coupled to the mounting panel 104, and the second pulley 426 is in rolling communication with the flexible element 414. In another example, a plasma display (e.g. a display screen 102 shown in FIG. 1) is coupled to the device panel 106.

[0047] Optionally, a fastener 700 (FIG. 7) is provided that extends from a face of the mounting panel 104. In another example, a dog 702 is provided that extends from a face of the mounting panel 104. The method 1100 includes, for example, coupling the dog 702 with a surface bracket 800 (FIG. 10). A detent (e.g. detent surface 812) is engaged against the dog 702 to secure the mounting panel 104 to the surface bracket 800.

[0048] In one example, a washer (e.g. washer 604 shown in FIG. 6) is engaged to at least one of the device panel 106 and the mounting panel 104. The pin 600 extends through the washer 604, and a nut 602 coupled around the pin 600 engages against the washer 600. In another example, a lubricious coating is applied between the washer 604 and at least one of the device panel 106 and the mounting panel 104.

[0049] In another example, a first portion of a second elastic member 402 is coupled to the mounting panel 104 and a second portion of the second elastic member 402 is coupled to the bridge bracket 406. In yet another example, a pretensioning member 502 (FIG. 5) is coupled to the mounting panel 104. Optionally, the at least one elastic member 402 is coupled to a tie bar 506 and the tie bar is moveably secured to the pretensioning member 502.

CONCLUSION

[0050] Using examples described above, a number of advantages are realized. One advantage includes a mounting device having an attenuating assembly to retain a display panel in a desired orientation. The attenuating assembly, assists in preventing an elastic member from moving the display panel toward a mounting panel. The attenuating assembly also transmits sufficient moment to the display panel to counterbalance the moment provided by the weight of the display panel and a display screen coupled thereto. Another advantage includes a compact mounting device having the attenuating assembly and the elastic member extending along the mounting panel so the mounting device presents a narrow profile. As a result, the mounting device takes up little space when mounted to a surface, such as a wall or ceiling. Another advantage includes a mounting device with a pretensioning member to ensure sufficient tension is provided by the elastic member to retain the display panel and the display screen in a desired orientation.

[0051] Although selected advantages are detailed above, the list is not intended to be exhaustive. Although specific examples have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art that any arrangement which is calculated to achieve the same purpose may be substituted for the specific embodiment shown. This application is intended to cover any adaptations or variations of the present invention. It is to be understood that the above description is intended to be illustrative, and not restrictive. Combinations of the above embodiments, and other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention includes any other applications in which the above structures and fabrication methods are used.

What is claimed is:

- 1. An apparatus comprising:
  - a mounting panel;
  - a device panel rotatably coupled to the mounting panel;

at least one elastic member coupled at a first portion to the mounting panel;

a first pulley rotatably coupled substantially adjacent to a second portion of the at least one elastic member, wherein the first pulley is moveable with the second portion of the at least one elastic member; and

a flexible element coupled between the mounting panel and the device panel, wherein the flexible element is in rolling communication with the first pulley.

2. The apparatus of claim 1, further comprising a second pulley rotatably coupled to the mounting panel, wherein the second pulley is in rolling communication with the flexible element.

3. The apparatus of claim 1, wherein at least one fastener extends from a face of the mounting panel.

4. The apparatus of claim 3, wherein at least one dog extends from a face of the mounting panel.

5. The apparatus of claim 4, further comprising a surface bracket, wherein the surface bracket is sized and shaped to receive the at least one dog.

6. The apparatus of claim 5, wherein the surface bracket includes at least one detent sized and shaped to engage against the at least one dog and secure the mounting panel to the surface bracket.

7. The apparatus of claim 1, wherein a pretensioning member is coupled to the mounting panel.

8. The apparatus of claim 7, wherein the first portion of the at least one elastic member is coupled to a tie bar and the tie bar is moveably secured along the pretensioning member.

9. The apparatus of claim 8, wherein the pretensioning member includes threading and the tie bar includes corresponding threading engaged against the threading on the pretensioning member.

10. The apparatus of claim 8, wherein the mounting panel includes at least one flange sized and shaped to engage against the tie bar.

11. The apparatus of claim 1, wherein a bridge bracket extends between the first pulley and the second portion of the at least one elastic member.

12. The apparatus of claim 11, wherein a first portion of a second elastic member is coupled to the mounting panel and a second portion is coupled to the bridge bracket.

13. The apparatus of claim 1, further comprising a plasma display coupled to the device panel.

14. The apparatus of claim 1, wherein the flexible element includes a cable.

15. The apparatus of claim 1, wherein the elastic member includes a coiled spring.

16. The apparatus of claim 1, wherein the device panel is hingedly coupled to the mounting panel.

17. The apparatus of claim 16, wherein a pin extends between the device panel and the mounting panel, and a washer is engaged against at least one of the device panel and the mounting panel.

18. The apparatus of claim 17, wherein a lubricious coating is between the washer and at least one of the device panel and the mounting panel.

19. An apparatus comprising:

- a mounting panel;
- a device panel rotatably coupled to the mounting panel;
- at least one elastic member coupled at a first portion to the mounting panel; and

an attenuating means for adjusting the tension of the at least one elastic member with movement of the device panel, wherein a second portion of the at least one elastic member is coupled to the attenuating means.

**20.** The apparatus of claim 19, wherein the attenuating means comprises:

- a first pulley rotatably coupled to a second portion of the at least one elastic member, wherein the first pulley is moveable with the second portion of the at least one elastic member;
- a second pulley rotatably coupled to the mounting panel; and
- a flexible element coupled between the mounting panel and the device panel, wherein the flexible element is in rolling communication with the first and second pulleys.

**21.** The apparatus of claim 20, wherein a bridge bracket extends between the first pulley and the second portion of the at least one elastic member.

**22.** The apparatus of claim 21, wherein a second elastic member is coupled at a first portion to the mounting panel and coupled at a second portion to the bridge bracket.

**23.** The apparatus of claim 19, wherein a pretensioning member is coupled to the mounting panel.

**24.** The apparatus of claim 23, wherein the first portion of the at least one elastic member is coupled to a tie bar and the tie bar is moveably secured along the pretensioning member.

**25.** An apparatus comprising

- a mounting panel;
- a device panel rotatably coupled to the mounting panel; and
- an attenuating assembly including:
  - at least one elastic member coupled at a first portion to the mounting panel, a first pulley rotatably coupled substantially adjacent to a second portion of the at least one elastic member, a flexible element coupled between the mounting panel and the device panel, wherein the first pulley is in rolling communication with the flexible element, and
  - wherein the first pulley is moveably positioned along the flexible element so the elastic member retains the device panel in a desired orientation relative to the mounting panel.

**26.** The apparatus of claim 25, further comprising a second pulley rotatably coupled to the mounting panel, wherein the second pulley is in rolling communication with the flexible element.

**27.** The apparatus of claim 25, wherein a pretensioning member is coupled to the mounting panel.

**28.** The apparatus of claim 27, wherein the first end of the at least one elastic member is coupled to a tie bar and the tie bar is moveably secured along the pretensioning member.

**29.** A method comprising:

- rotatably coupling a device panel to a mounting panel;
- coupling a first portion of at least one elastic member to the mounting panel;
- rotatably coupling a first pulley substantially adjacent to a second portion of the at least one elastic member; and
- coupling a flexible element between the mounting panel and the device panel, wherein the flexible element is in rolling communication with the first pulley.

**30.** The method of claim 29, further comprising rotatably coupling a second pulley to the mounting panel, wherein the second pulley is in rolling communication with the flexible element.

**31.** The method of claim 29, further comprising coupling a plasma display to the device panel.

**32.** The method of claim 29, wherein rotatably coupling a device panel to the mounting panel includes coupling the device panel to the mounting panel with a pin extending therebetween.

**33.** The method of claim 32, wherein rotatably coupling a device panel to the mounting panel includes engaging a washer to at least one of the device panel and the mounting panel.

**34.** The method of claim 33, further comprising applying a lubricious coating between the washer and at least one of the device panel and the mounting panel.

**35.** The method of claim 29, wherein rotatably coupling the first pulley substantially adjacent to the second portion of the at least one elastic member includes coupling a bridge bracket between the first pulley and the second portion of the at least one elastic member.

**36.** The method of claim 35, further comprising coupling a first portion of a second elastic member to the mounting panel and coupling a second portion of the second elastic member to the bridge bracket.

**37.** The method of claim 29, wherein coupling the first portion of the at least one elastic member to the mounting panel includes coupling a pretensioning member to the mounting panel.

**38.** The method of claim 37, wherein coupling the first portion of the at least one elastic member to the mounting panel includes coupling the at least one elastic member to a tie bar and moveably securing the tie bar to the pretensioning member.

**39.** The method of claim 29, wherein coupling the first portion of at least one elastic member to the mounting panel includes coupling a first portion of at least one coiled spring to the mounting panel

**40.** The method of claim 29, further comprising providing a fastener extending from a face of the mounting panel.

**41.** The method of claim 40, further comprising providing a dog extending from a face of the mounting panel.

**42.** The apparatus of claim 41, further comprising coupling the at least one dog with a surface bracket.

**43.** The apparatus of claim 42, wherein coupling the at least one dog with the surface bracket includes engaging at least one detent against the at least one dog and securing the mounting panel to the surface bracket.

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