US 20120061543A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2012/0061543 A1**

(43) **Pub. Date: Mar. 15, 2012**

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(54) **ADJUSTABLE FLAT-PANEL DISPLAY MOUNT**

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(21) Appl. No.: **13/228,234**

(22) Filed: **Sep. 8, 2011**

Related U.S. Application Data

(60) Provisional application No. 61/381,298, filed on Sep. 9, 2010.

Publication Classification

(51) **Int. Cl.**

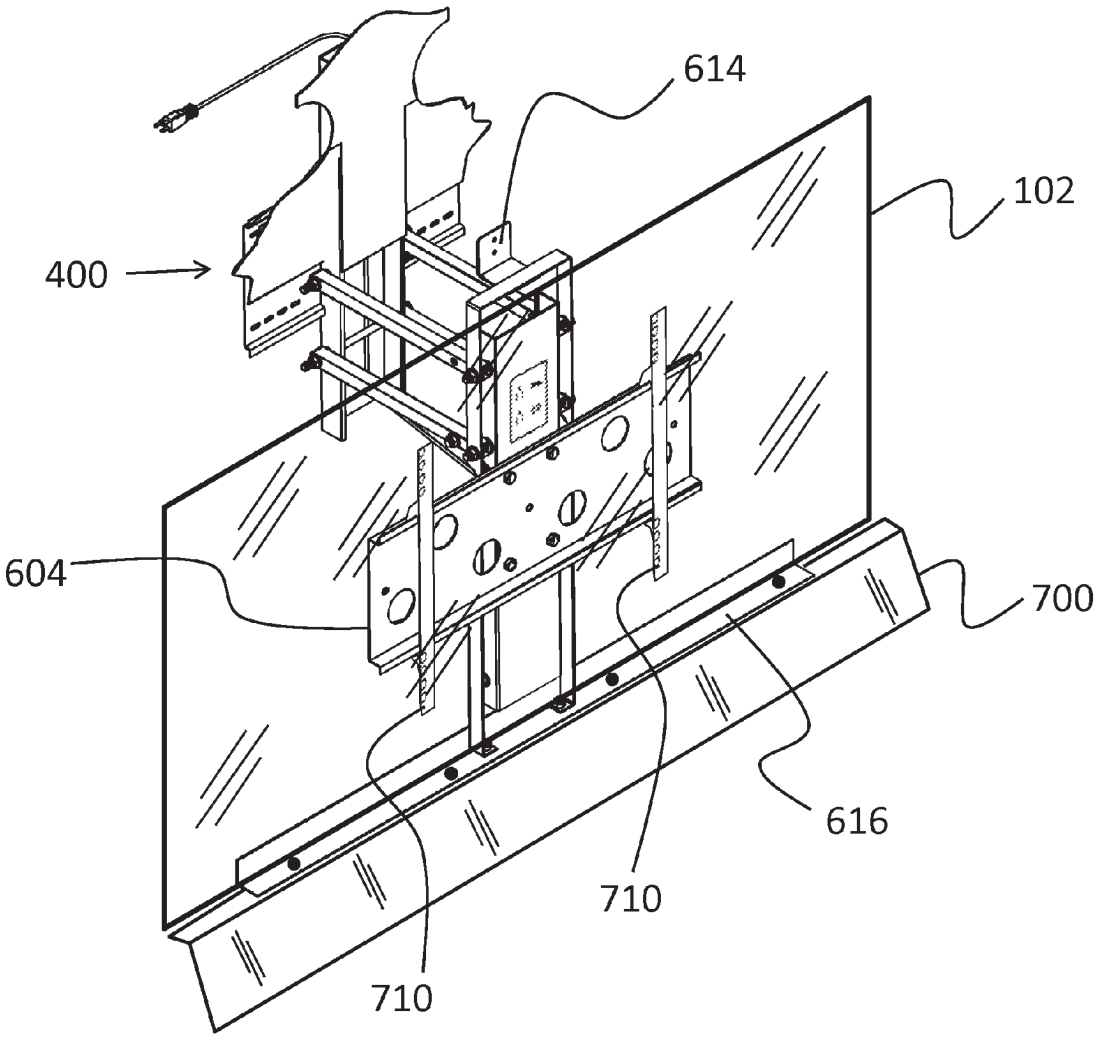
H05K 7/00 (2006.01)

F16M 13/02 (2006.01)

(52) **U.S. Cl.** **248/292.11**; 248/291.1; 248/292.13

(57) **ABSTRACT**

An adjustable flat-panel display mount is described. The display mount includes a mounting plate for mounting with a surface, such as a wall. A front mount is included. The front mount is formed to attach with a television display and affix the television display with the display mount. A swing out apparatus is pivotally connected between the mounting plate and the front mount. The swing out apparatus includes a set of bars that, together with the mounting plate and front mount, form a four-bar linkage. The swing out apparatus is formed to swing the front mount between a retracted position and an extended position, such that motion from the retracted to extended position moves the front mount, and attached television display, out and down.



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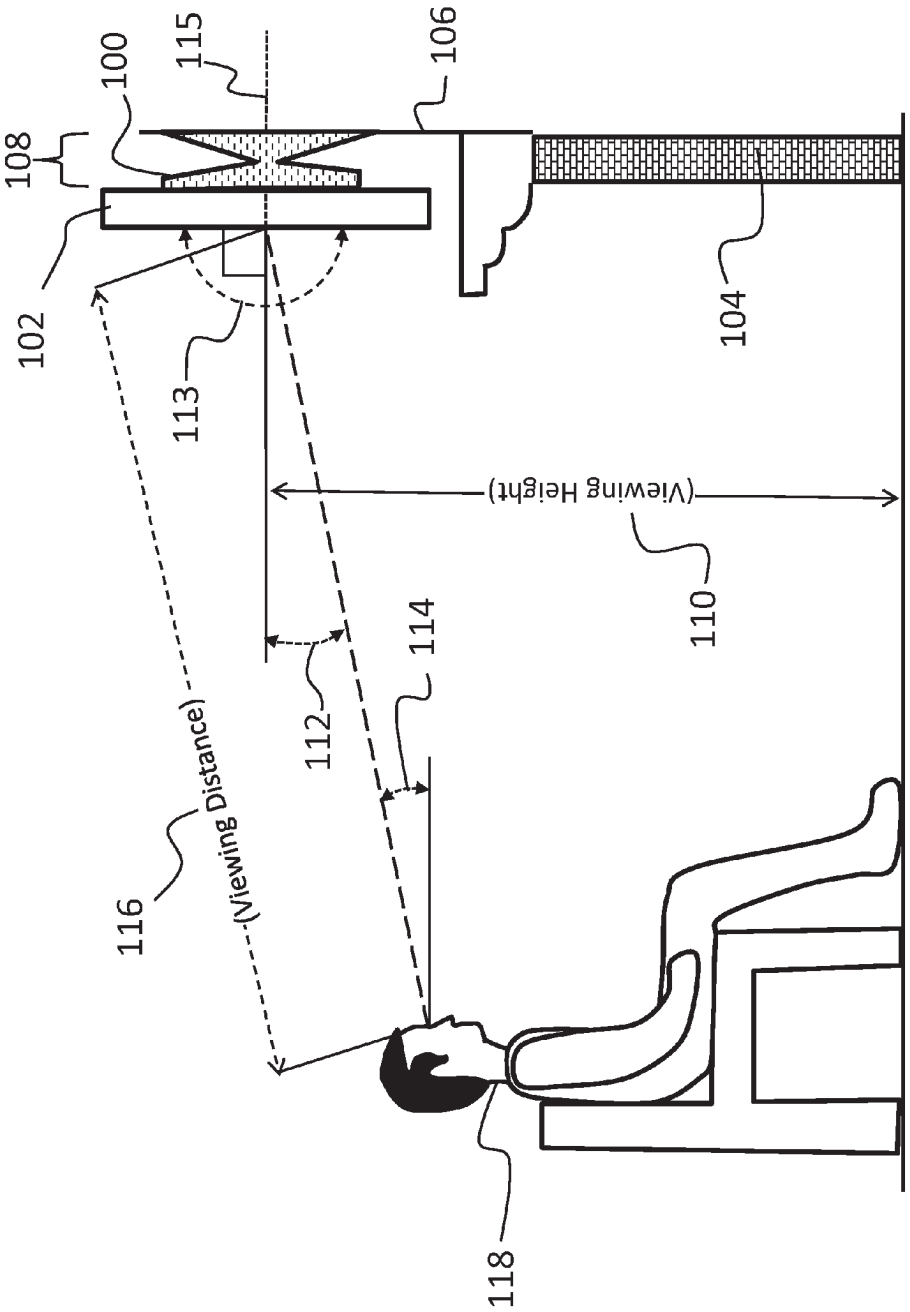

FIG. 1
(Prior Art)

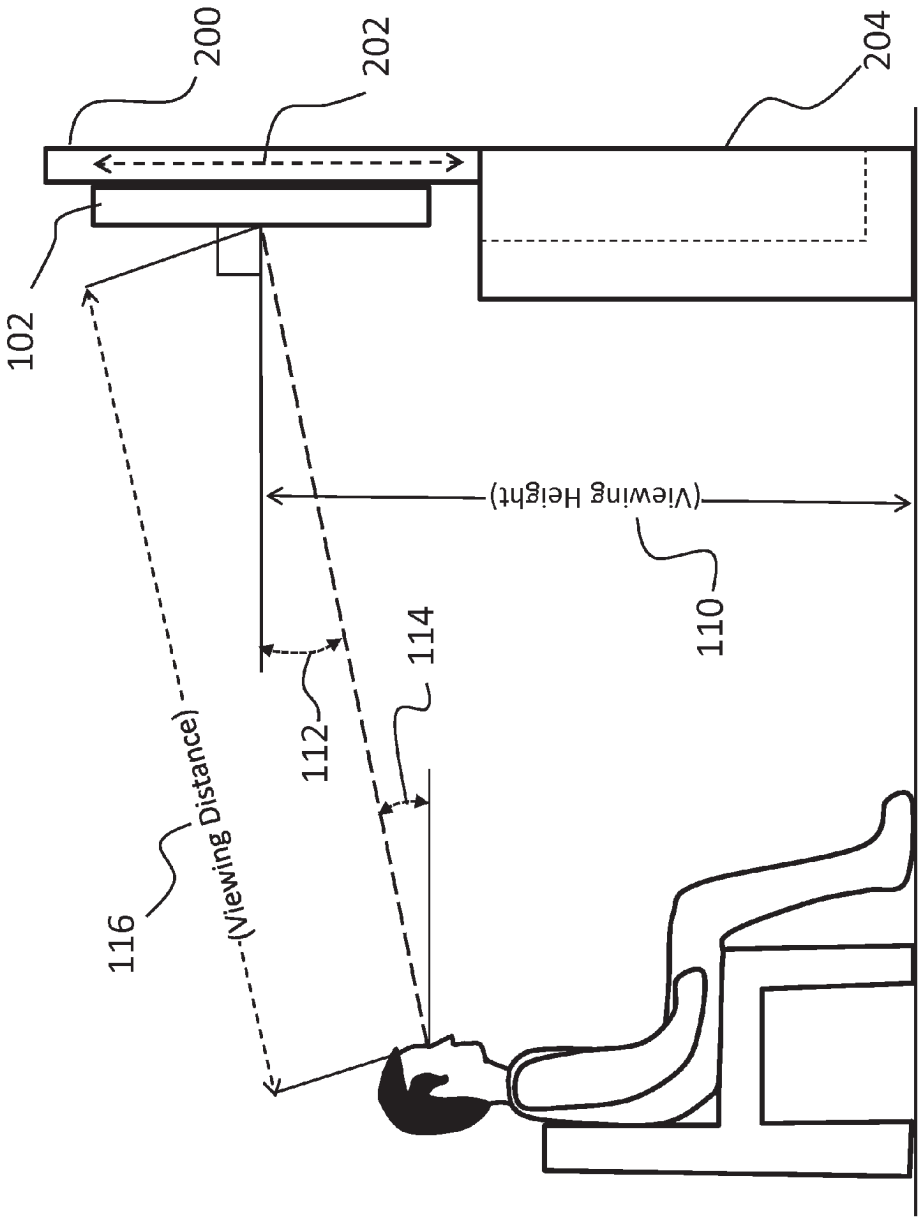

FIG. 2
(Prior Art)

Lumi Ex. 1005
PGR Petition - USP 11,781,703

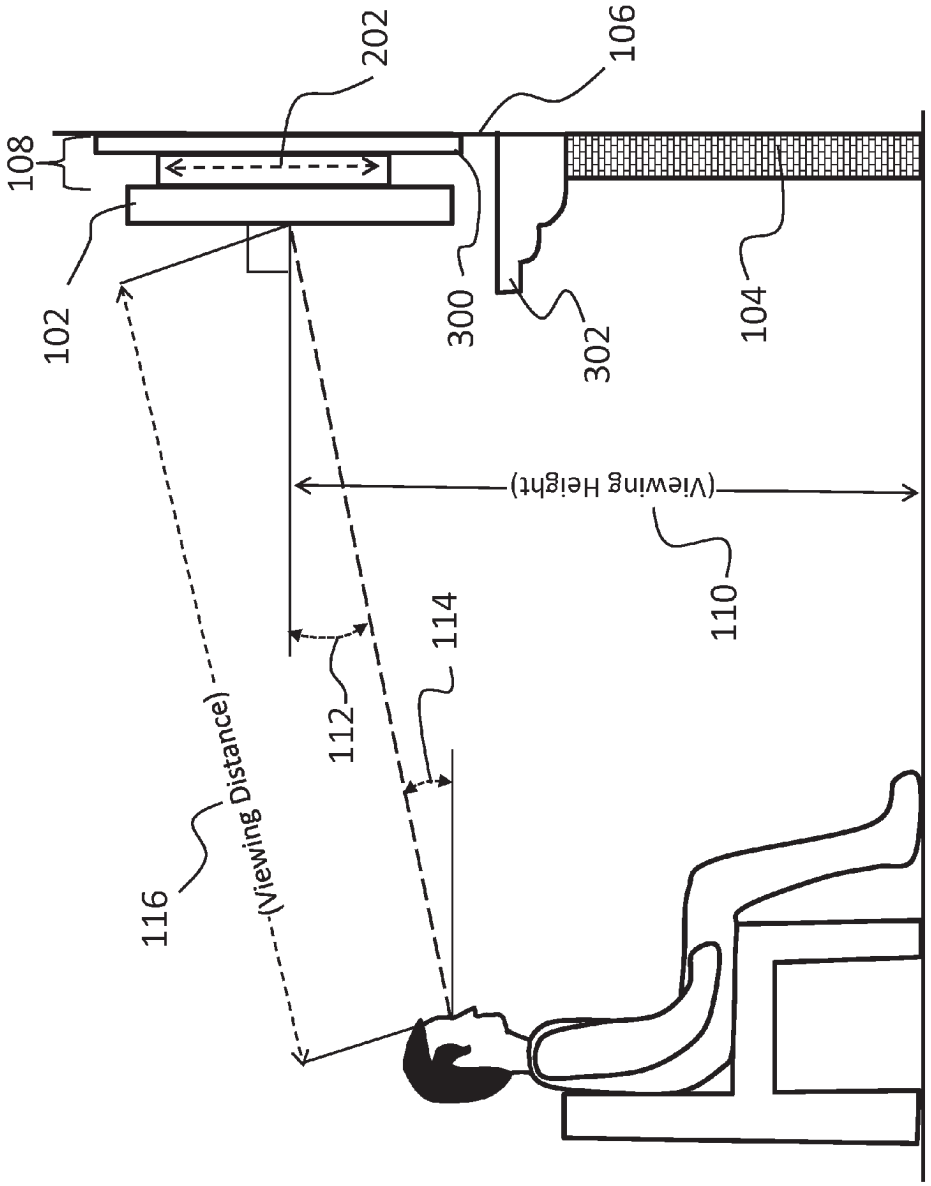

FIG. 3
(Prior Art)

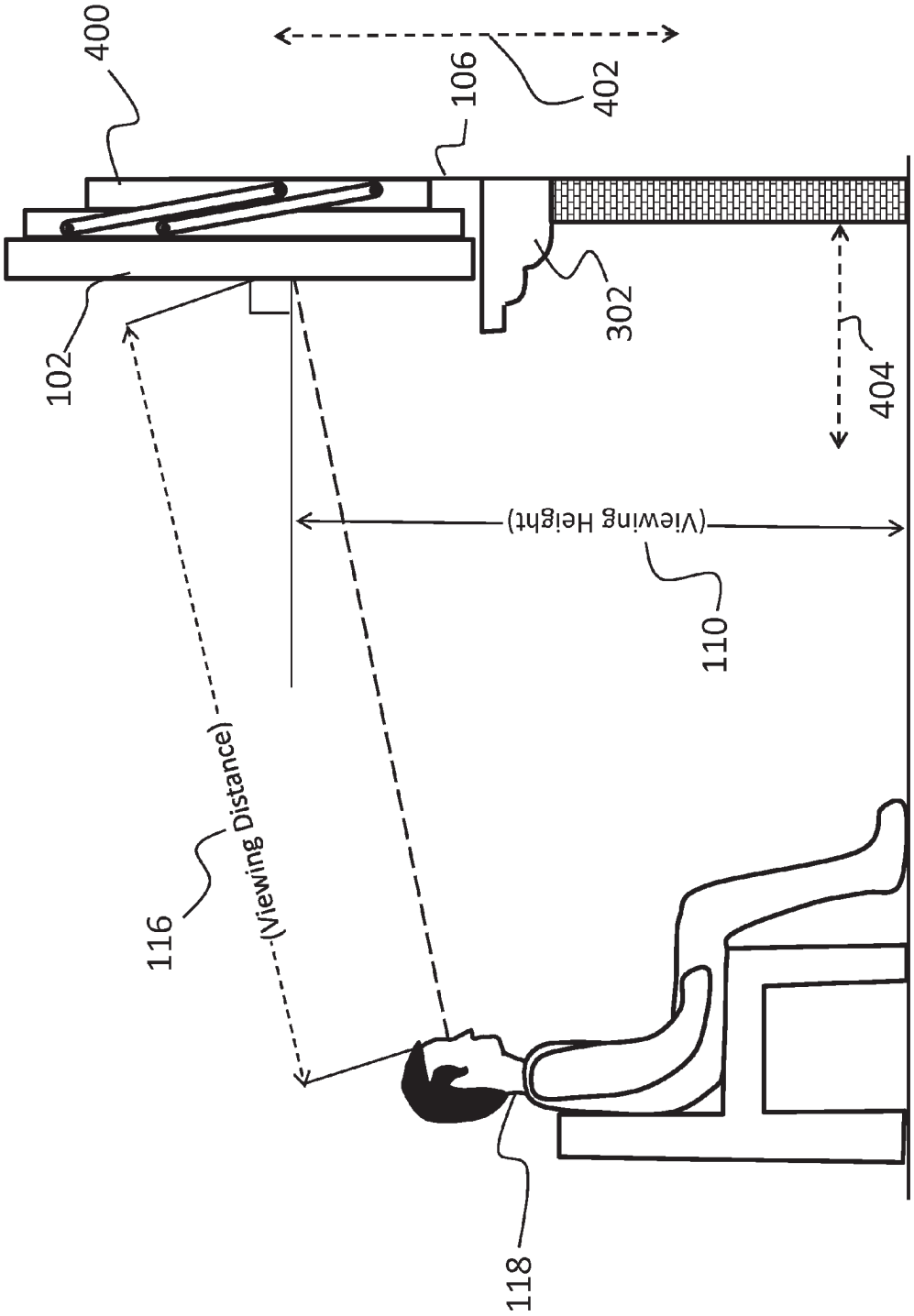

FIG. 4

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PGR Petition - USP 11,781,703

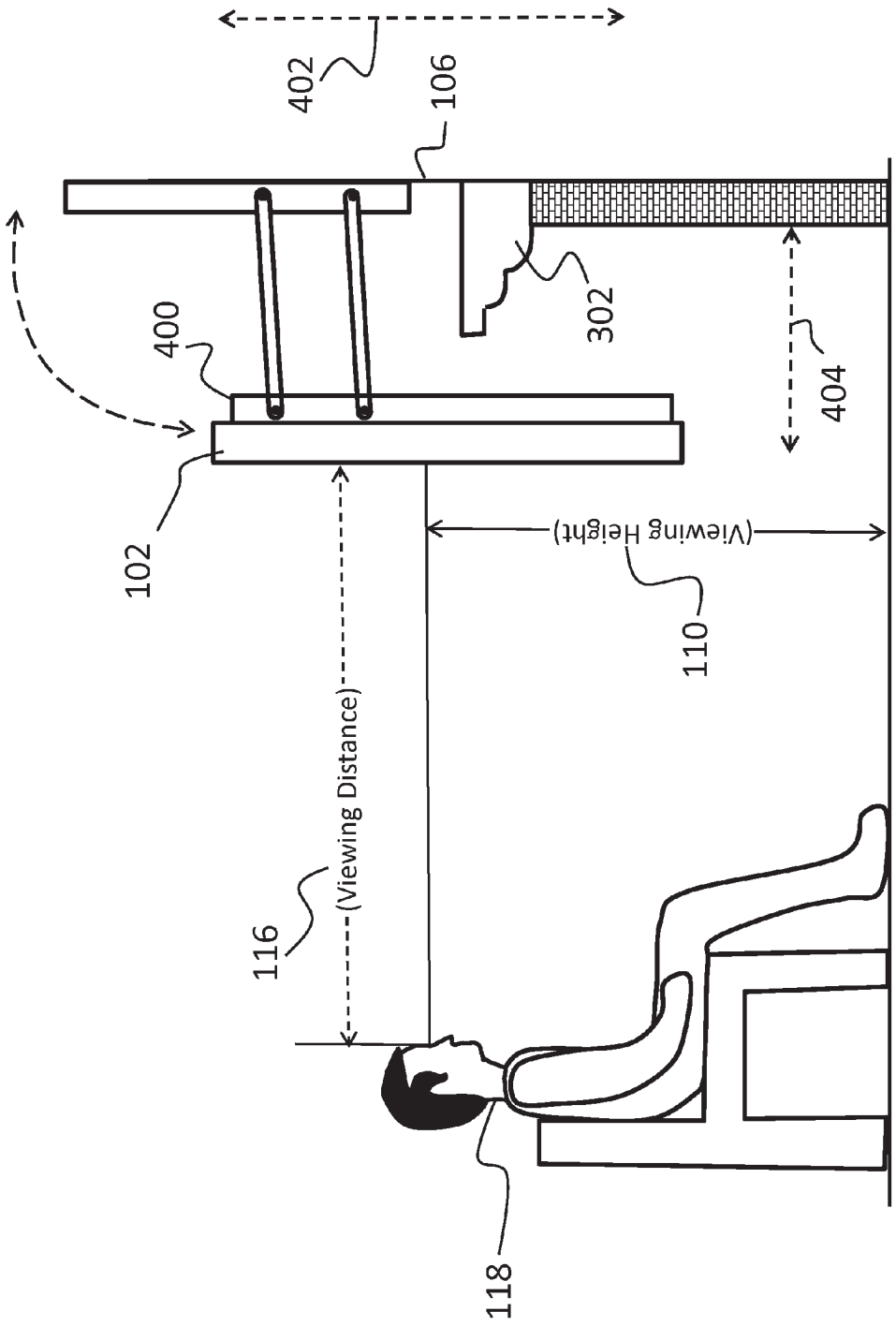

FIG. 5

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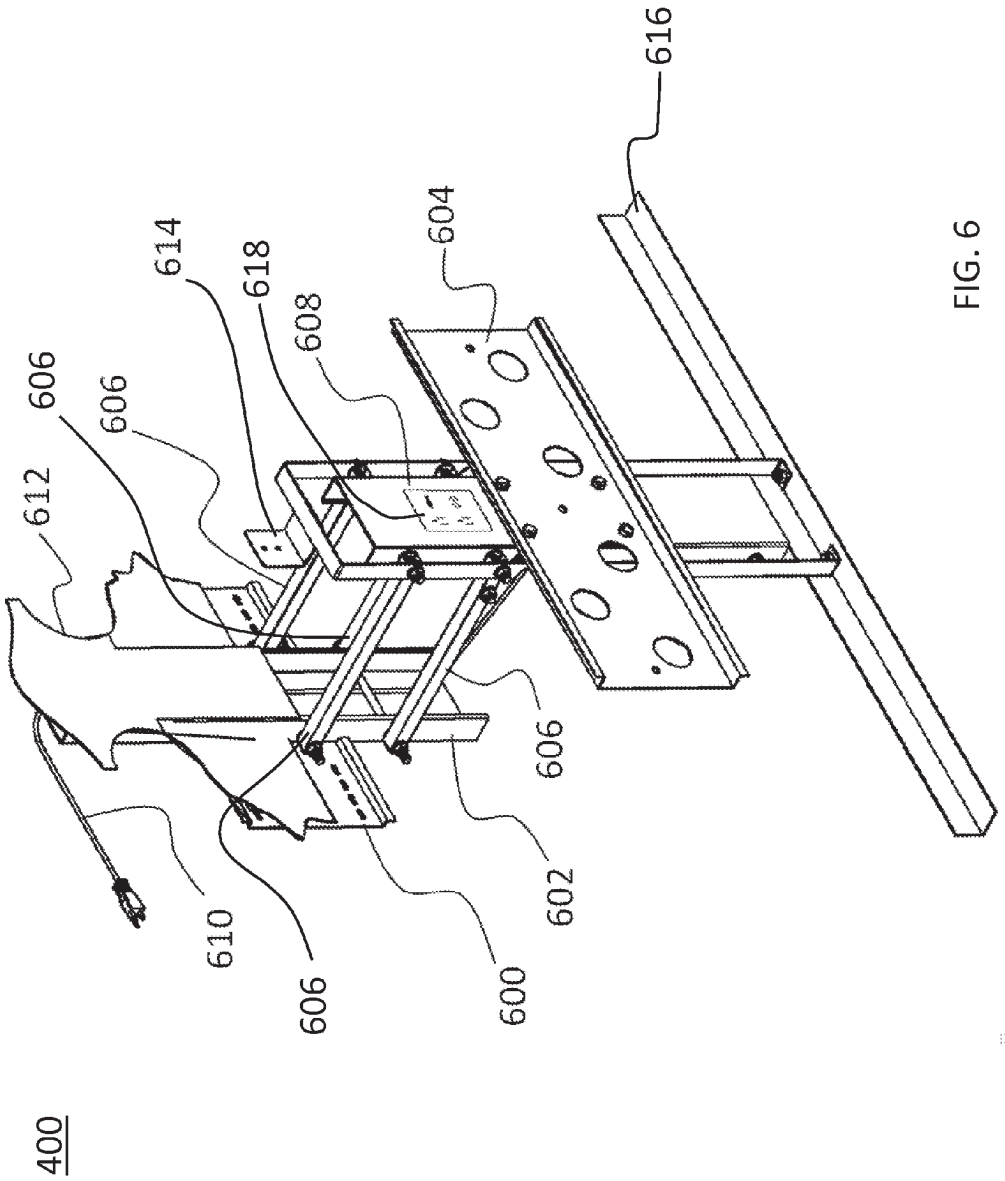

FIG. 6

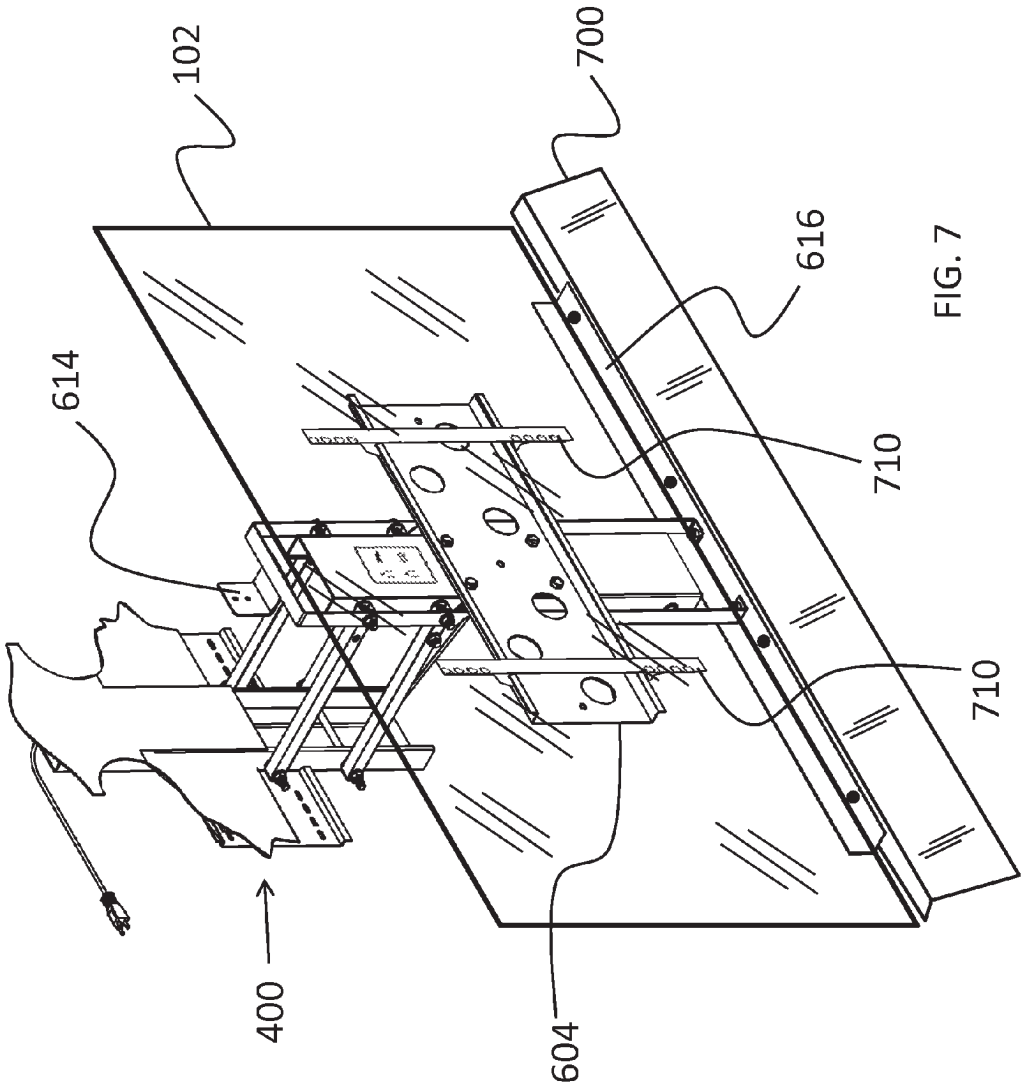

FIG. 7

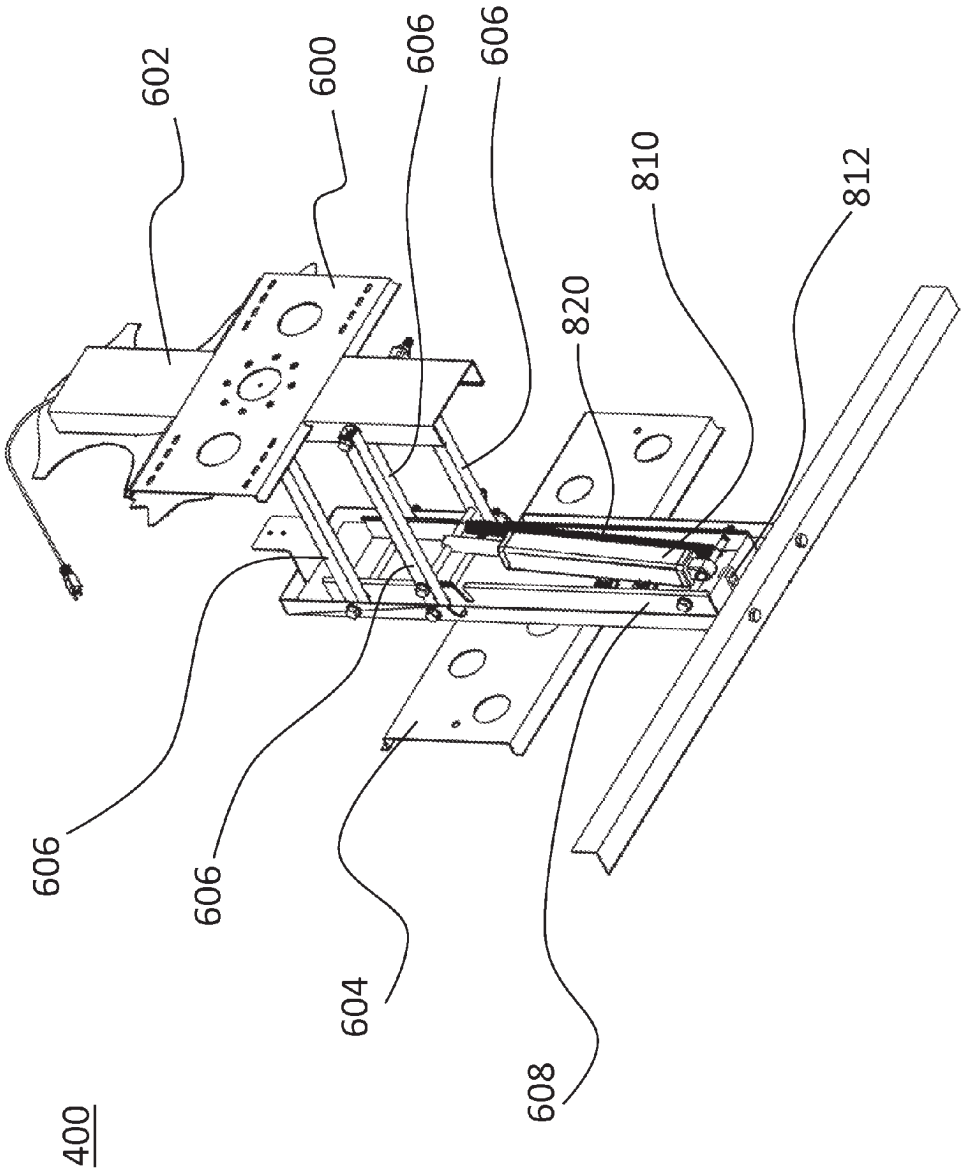

FIG. 8

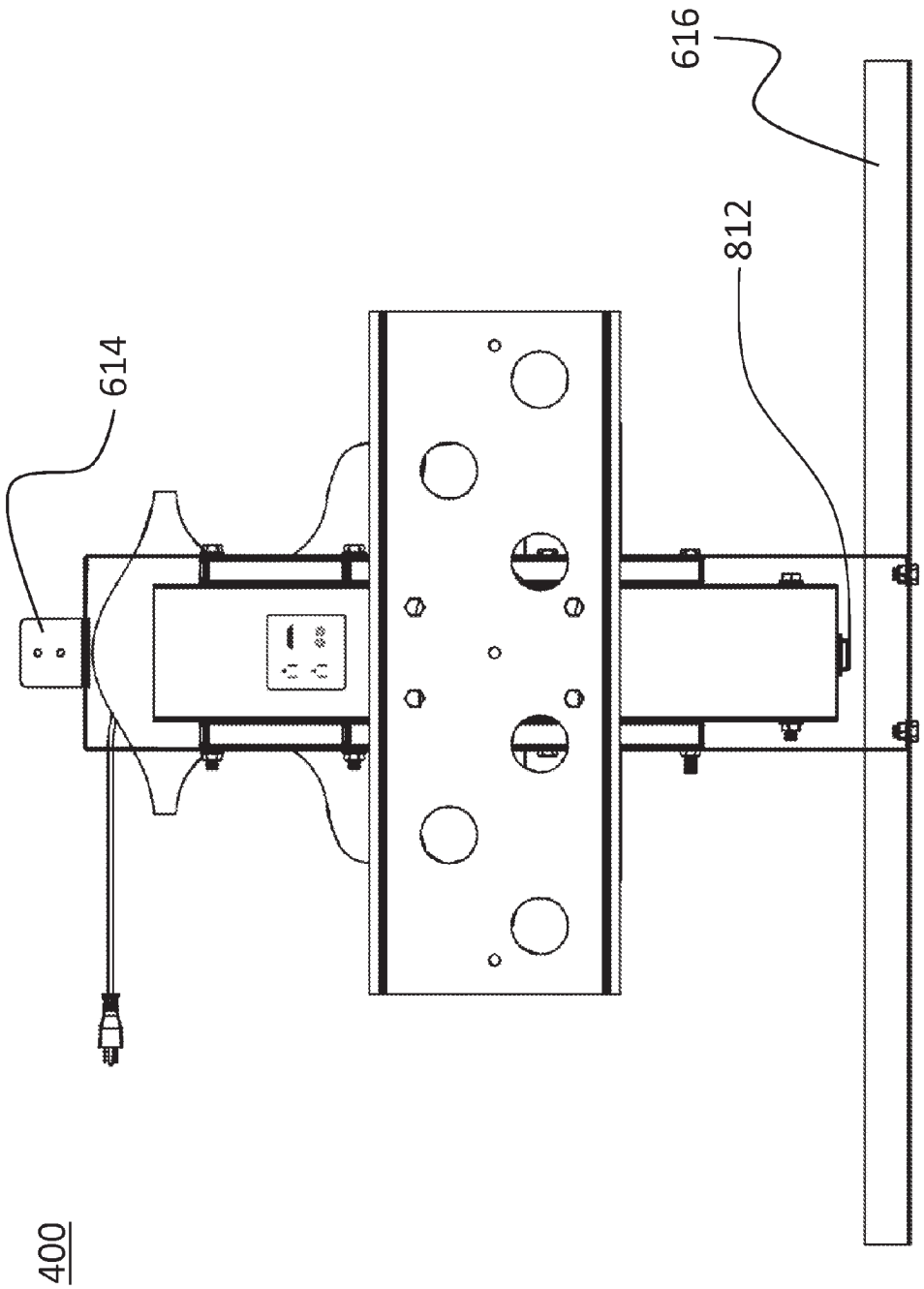

FIG. 9

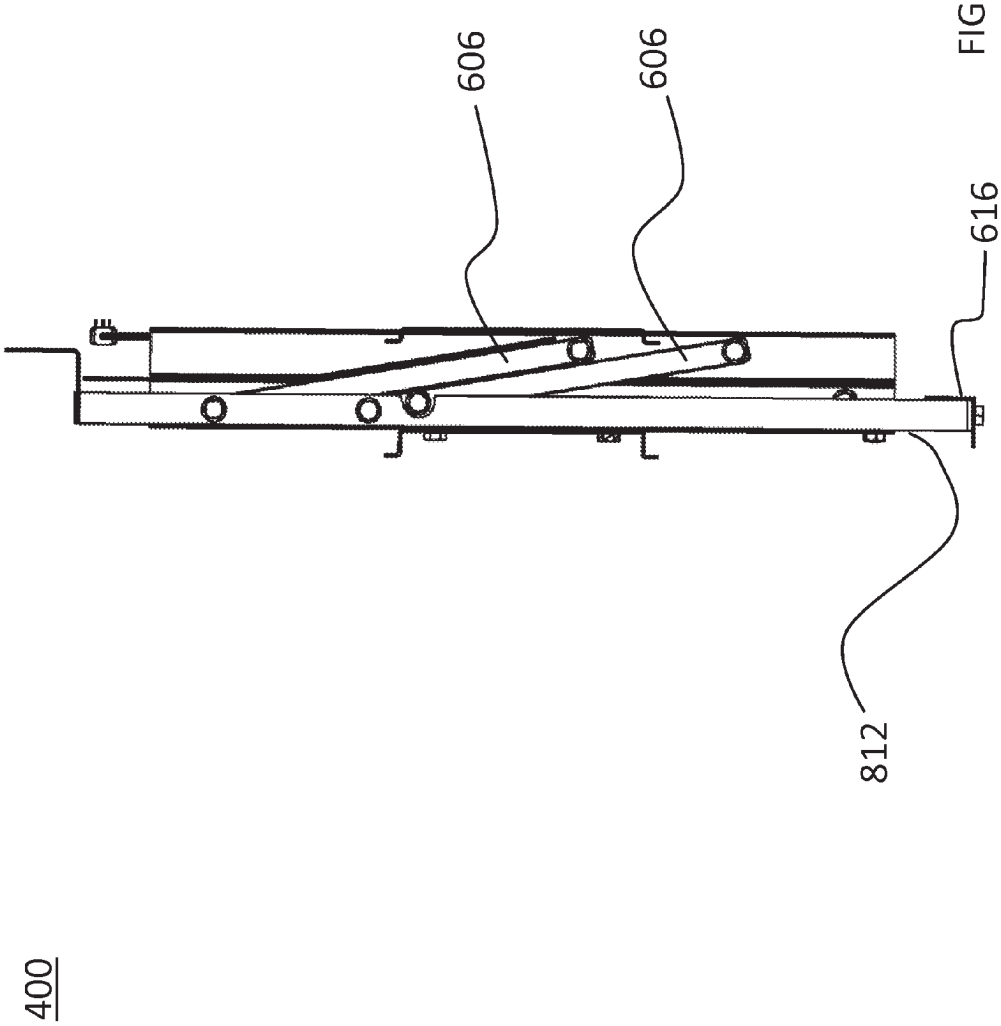

FIG. 10

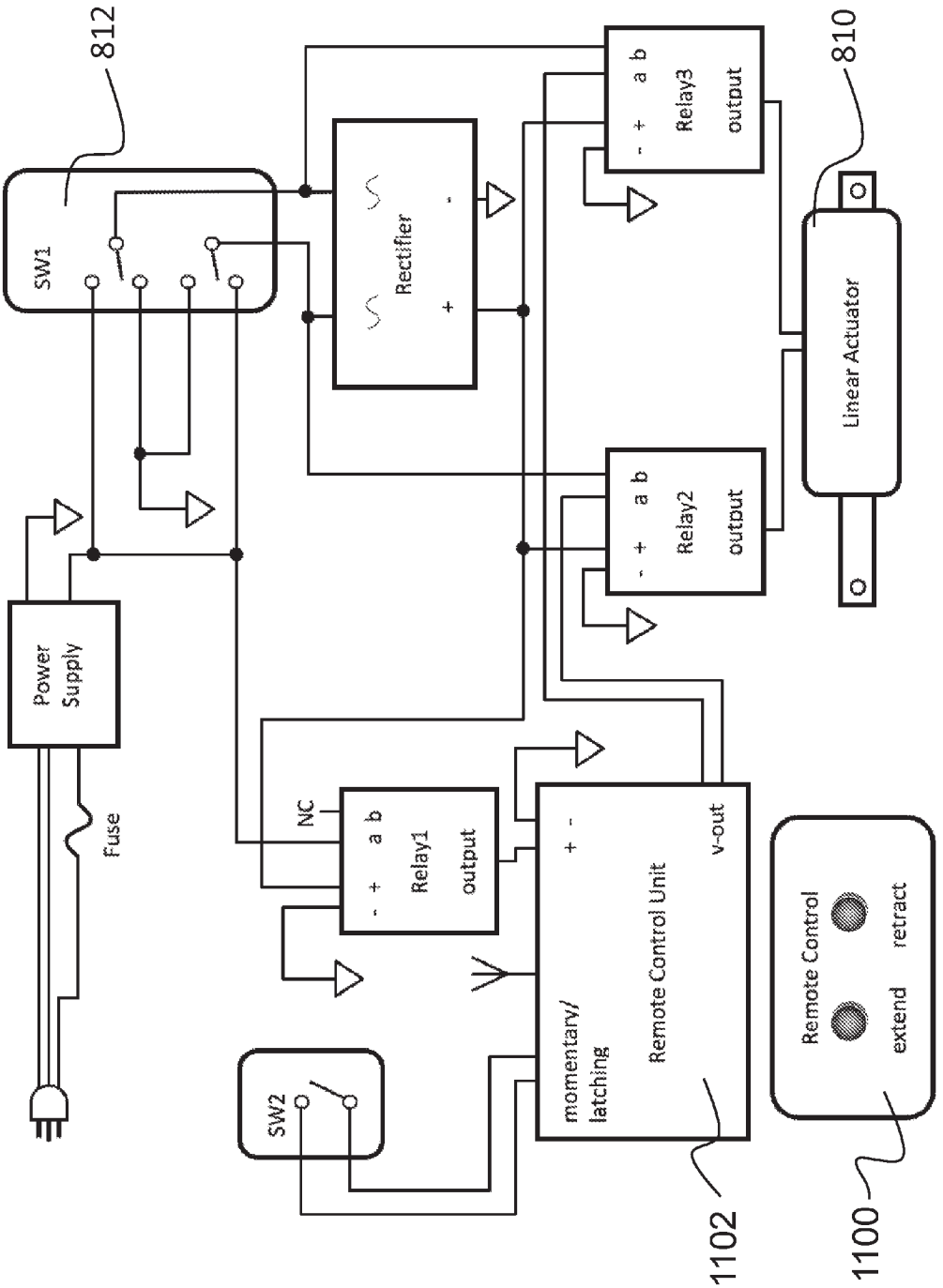
812
SW1
Rectifier
Relay3
output
a b
- +
810
Linear Actuator
Relay2
output
Power Supply
Fuse
NC
Relay1
output
momentary/
latching
Remote Control Unit
v-out
Remote Control
extend
retract
SW2
1102
1100

FIG. 11

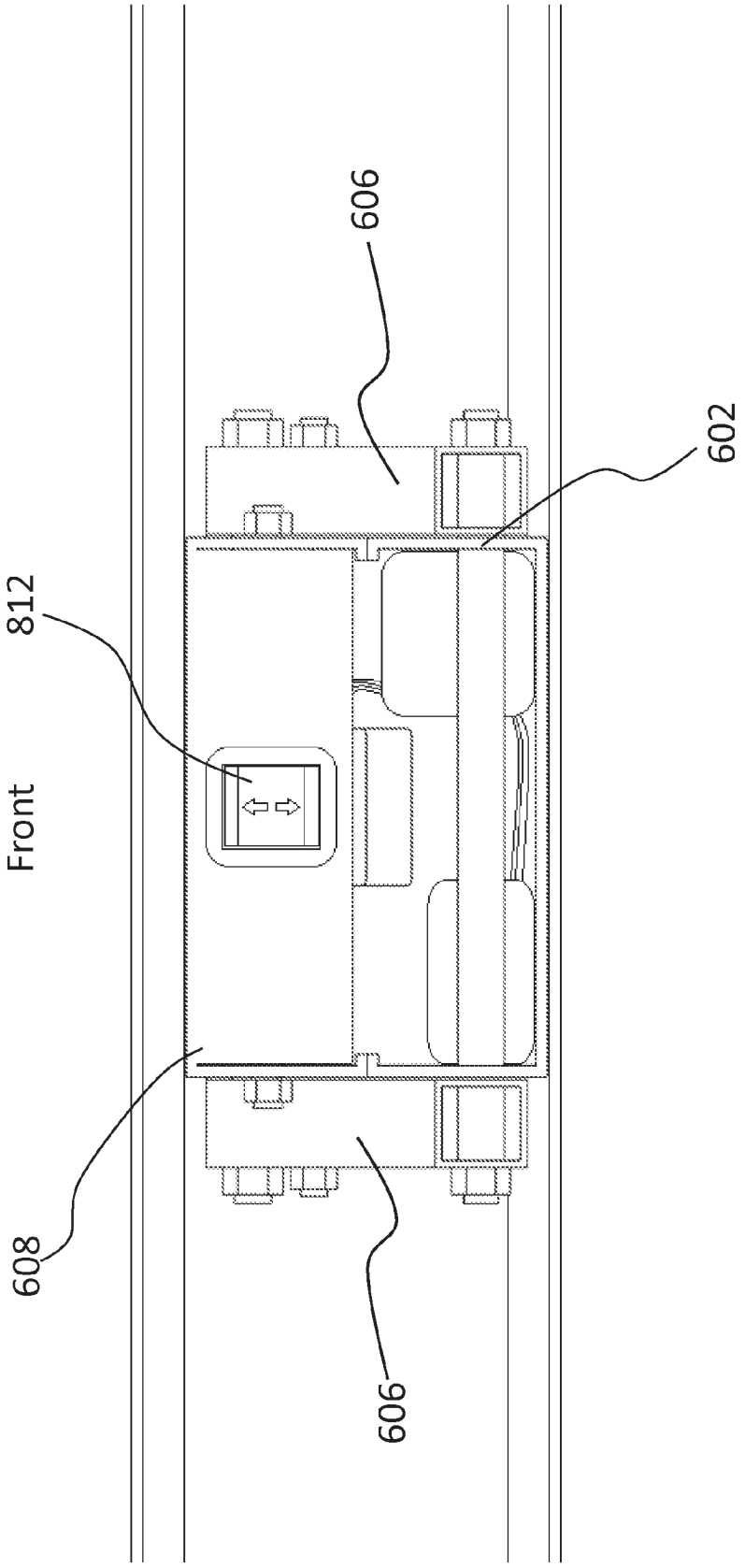

FIG. 12

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PGR Petition - USP 11,781,703

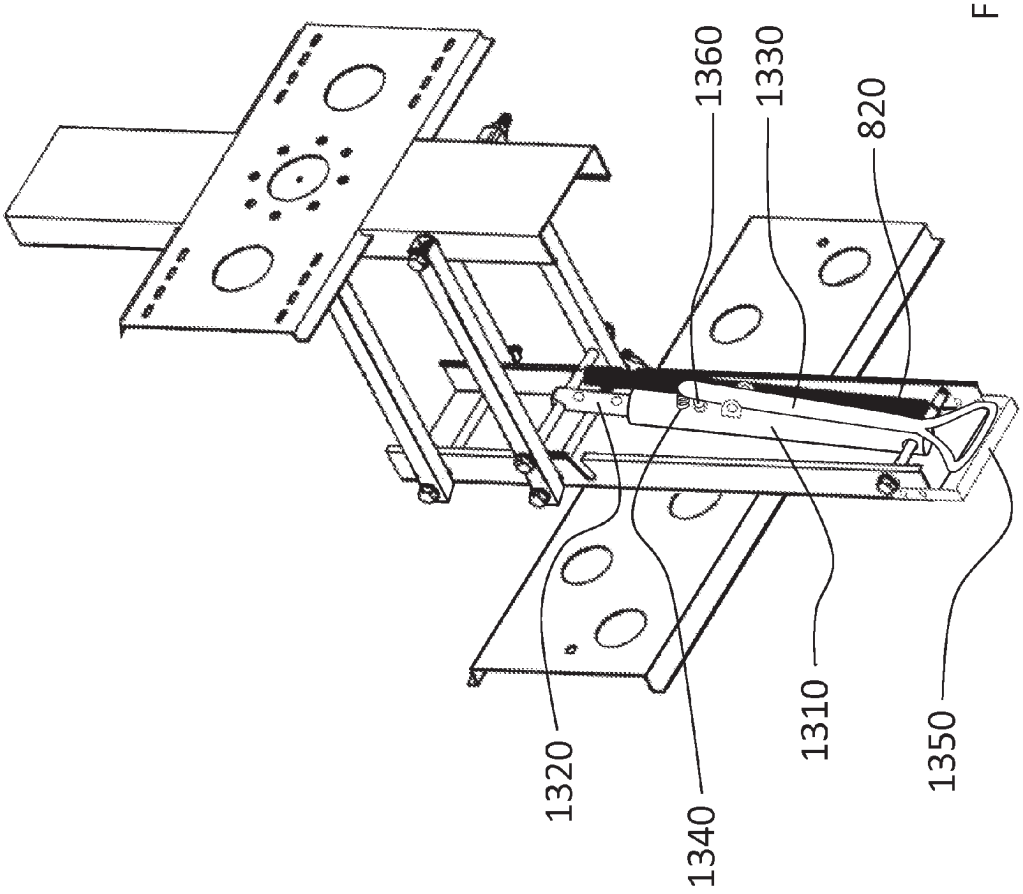
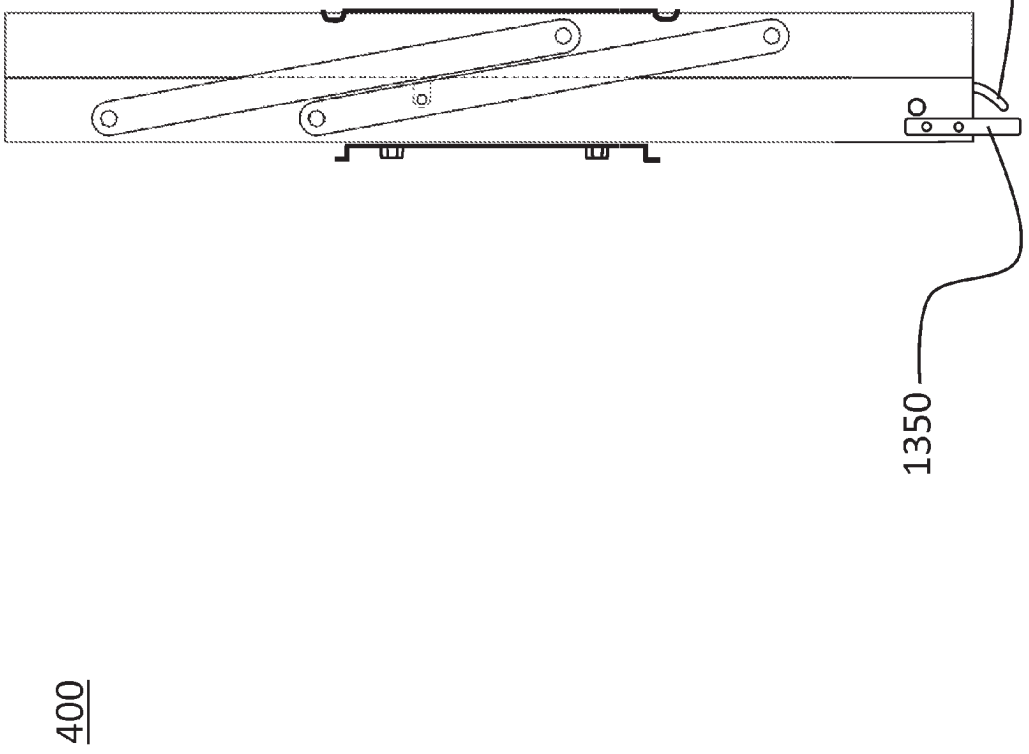


FIG. 13

FIG. 14



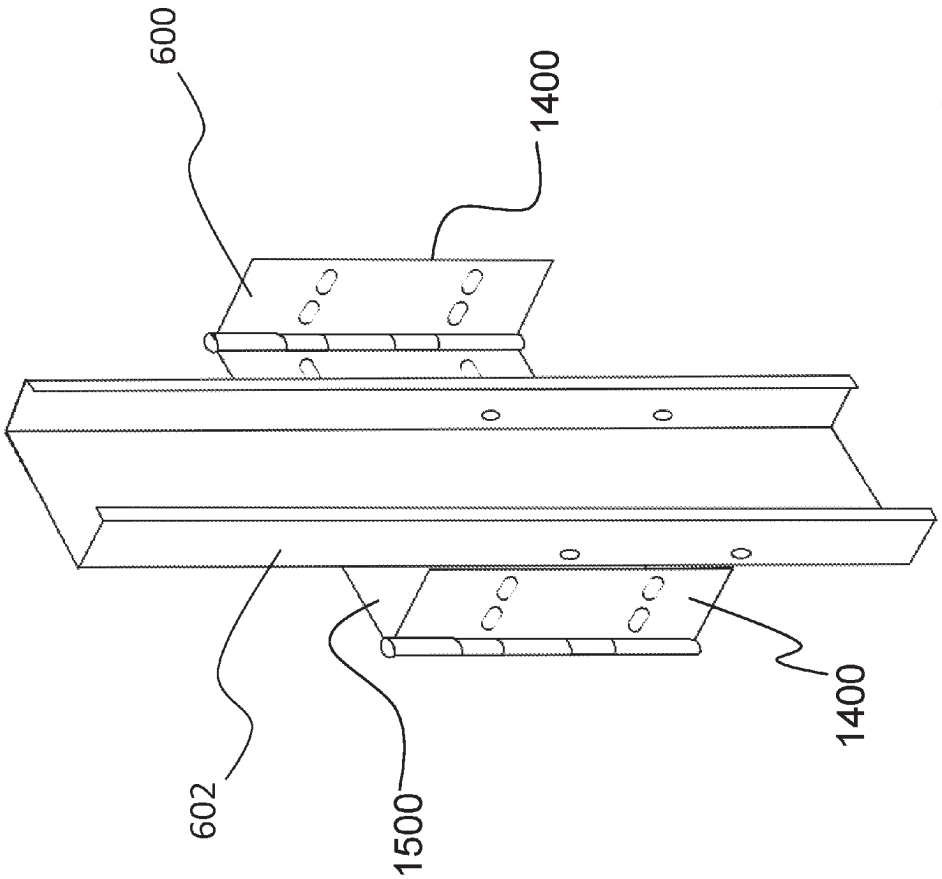


FIG. 15

ADJUSTABLE FLAT-PANEL DISPLAY MOUNT

PRIORITY CLAIM

[0001] This is a non-provisional patent application of U.S. Provisional Application No. 61/381,298, filed, Sep. 9, 2010, entitled, "Adjustable Flat-Panel Display Mount System."

BACKGROUND OF THE INVENTION

[0002] (1) Field of Invention

[0003] The present invention relates to a display mount and, more particularly, to an adjustable flat-panel display mount for mounting the flat-panel display to a surface and adjusting the viewing direction and position of the flat-panel display.

[0004] (2) Description of Related Art

[0005] Flat-panel displays are increasingly popular in homes as televisions and/or computer monitors. Advances in technology and reductions in prices have made them increasingly prevalent in homes throughout the United States and abroad. Unlike their bulky and heavier predecessors, most flat-panel displays are wall-mounted. In homes that have a fireplace, a common approach is to mount the flat-panel display over the fireplace mantel. This arrangement is generally more aesthetically pleasing since less pieces of furniture compete with the living room space. The fireplace is also a natural focal point in a living room and furniture is typically arranged to reflect that fact.

[0006] Mounting a display over a fireplace often results in the display being in a position that is awkward for viewing and uncomfortable for persons viewing it from a seated position. Viewers can experience neck and shoulder strain from having to tilt their heads for an extended period of time.

[0007] Mounting a display over a fireplace leads to an increased viewing distance, which reduces the viewer's ability to appreciate the image detail. Additionally, mounting a display over a fireplace leads to viewing angles that distort the display image by changing the image aspect ratio, thereby reducing the viewer's ability to appreciate the image.

[0008] Further, three-dimensional (3-D) televisions are now available on the market. Existing and anticipated 3-D Models are sensitive to viewing angles and viewing distances.

[0009] Therefore, in satisfying the need to alter the viewing angle of traditional and 3-D televisions, several types of flat-panel display mounts are available. For example and as shown in FIG. **1**, existing display mounts **100** are commonly used to mount a flat-panel display **102** (e.g., television or computer display) over a fireplace **104** or on a wall surface **106**. Some allow for adjustments to the distance from the mounting point **108**, viewing height **110**, and the image distortion angle **112**. The distance from the mounting point **108** and viewing height **110** affect the viewer inclination angle **114** and the viewing distance **116**.

[0010] One type of mount affixes a display to the wall surface **106**. Once installed, adjustments cannot be made to the viewing height **110**, the distance from the mounting point **108**, or the image distortion angle **112**. Therefore, the viewing distance **116** and the viewer inclination angle **114** are fixed and cannot be adjusted. Display mounts that do not allow for adjustment to the image distortion angle **112** distort the image aspect ratio and reduce the viewer's **118** ability to appreciate the image.

[0011] Another type of mount affixes a flat-panel display **102** to the wall and provides the ability to reduce the image distortion angle **112** by allowing for some rotation **113** along a horizontal axis **115**. Once installed, adjustments cannot be made to the distance from the mounting point **108**, or the viewing height **110**. Therefore, the viewing distance **116** and the viewer inclination angle **114** cannot be adjusted.

[0012] Yet another type of mount affixes a flat-panel display **102** to the wall and provides the ability to adjust the distance from the mounting point **108**. This type of device also often provides the ability to adjust the image distortion angle **112** along one or more axes. Such a mount enables the viewer **118** to make slight adjustments to the viewing distance **116**. However, such existing mounts do not allow for adjustments to the viewing height **110**. Therefore, the viewer inclination angle **114** cannot be adjusted.

[0013] The display mounts described above do not change the viewing height **110** as they cannot be lowered. Thus, the viewer inclination angle **114** from a seated position remains relatively unchanged. When these display mounts are mounted over a fireplace **104**, the viewing height **110** is awkward in that it creates conditions for an uncomfortable viewer inclination angle **114** when viewing the flat-panel display **102** from a seated position. Viewers **118** can experience neck, shoulder, and back strain from having to tilt their heads up for an extended period of time.

[0014] As shown in FIG. **2**, another type of mount **200** can adjust the viewing height **110** along a linear path **202**. This type of mount **200** enables for the raising and lowering of a flat-panel display **102** from a concealed structural location or from a piece of furniture **204**. This type of mount **200** generally requires a custom installation to incorporate it into a structure or piece of furniture **204**. While operable for adjusting the viewing height **110**, as it is lowered it becomes concealed, therefore, it has a negligible impact on viewer inclination angle **114**. This type of mount **200** does not have the ability to adjust the image distortion angle **112**. Further, neither the viewing distance **116** nor the viewer inclination angle **114** can be adjusted.

[0015] As shown in FIG. **3**, yet another type of mount **300** can adjust the viewing height **110** of a flat-panel display **102** along a wall surface **106** or mounting point, thereby adjusting the viewing distance **116**. Although allowing for adjustment along a linear path **202**, this type of device does not have the ability to adjust the distance from the mounting point **108** or the image distortion angle **112**. Importantly, such a mount **300** does not lend itself to be mounted over a fireplace **104** because the flat-panel display **102** cannot be lowered below the mantel **302**. A benefit of adjusting the viewing height **110** is lost by the fact that the minimum height is still above the fireplace mantel **302**. Thus, such a mount **300** generally does not have the ability to adjust the image distortion angle **112**.

[0016] In use, flat-panel displays **102** are often used for interactive activities such as video game playing. For video game playing and standard uses, it is beneficial to view the flat-panel display **102** at an appropriate image distortion angle **112**, viewer inclination angle **114**, and viewing distance **116**.

[0017] Thus, a continuing need exists for an adjustable flat-panel display mount that enables a display's position to be adjusted vertically as it is simultaneously moved away from the mounting point to avoid fixtures or other obstacles in its path.

SUMMARY OF INVENTION

[0018] While considering the failure of others to make use of all of the above components in this technology space, the

inventor unexpectedly realized that an adjustable display mount with an appropriately formed swing out apparatus (e.g., employing a four-bar linkage) would enable the mount to adjust the display vertically as it is simultaneously moved away from the mounting point to avoid fixtures or other obstacles.

[0019] Providing the ability to adjust the viewing height enables the viewer to adjust the height of the display to better suit a variety of activities. The viewing height can be decreased to view the display while seated and the viewing height can be increased to view the display while engaged in activities that are better performed while standing, such as interacting with video games or exercise videos.

[0020] The display mount includes a mounting plate for mounting with a surface, such as a wall. A front mount is included. The front mount is formed to attach with a flat-panel display (e.g., television display) and affix the flat-panel display with the display mount. A swing out apparatus is pivotally connected between the mounting plate and the front mount. As noted above, the swing out apparatus includes a set of bars that, together with the mounting plate and front mount, form a four-bar linkage. The swing out apparatus is formed to swing the front mount between a retracted position and an extended position, such that motion from the retracted to extended position moves the front mount, and attached television display, out and down.

[0021] In another aspect, the swing out apparatus further comprises a counterbalancing mechanism. The counterbalancing mechanism provides a counterbalancing force that is substantially equal to a gravitational force exerted by a flat-panel display when mounted on the display mount.

[0022] In yet another aspect, the mounting plate has a back portion and selectively positionable leaves. The selectively positionable leaves are formed such that they can be selectively positioned between being substantially planar with a back portion of the mount plate or perpendicular to the back portion of the mount plate, or any relative position therebetween. An example of such leaves include hinged side plates that are pivotally connected with the back portion.

[0023] In another aspect, a rear casing is connected to and between the mounting plate and the swing out apparatus. Additionally, a front casing is connected to and between the swing out apparatus and the front mount.

[0024] In another aspect, a heat shield is connected with the front mount to shield the television display from heat that may emanate from a fireplace or other heat source.

[0025] In yet another aspect, a linear actuator is attached with the swing out apparatus to swing the front mount between a retracted position and an extended position.

[0026] Further, a first switch is attached with the front casing. The first switch is operably connected with the linear actuator to allow for control of the linear actuator. Additionally, the first switch is a double-pole, double-throw switch, which is wired to operate the linear actuator in both positive and negative polarities.

[0027] A remote control unit is also operably connected with the linear actuator. The remote control unit is controlled wirelessly via a remote control to receive extend and retract signals from the remote control, such that upon actuation of the remote control, the remote control unit energizes the linear actuator in the appropriate polarity to cause it to extend or retract.

[0028] Further, the first switch is biased towards an open position to prevent the linear actuator from being energized when force is not being applied to the first switch and simultaneously yielding control to the remote control unit.

[0029] In yet another aspect, the display mount includes a lockable telescoping cylinder assembly attached with the swing out apparatus to swing the front mount between a retracted position and an extended position. The lockable telescoping cylinder assembly includes an adjustment lever to unlock the lockable telescoping cylinder assembly. An adjustment handle is included to operate and adjust the display mount. A lock biasing spring is provided to bias the adjustment lever in the locked position. A counterbalancing mechanism is included to provide a sufficient holding force to hold the display mount and attached flat-panel display at a fully extended or fully retracted position and points in between. Additionally, at least one adjustment stop is attached to the lockable telescoping cylinder assembly such that when the front mount is at a predetermined lowest position, the swing out apparatus engages the adjustment stop, thereby preventing the front mount from being positioned below the predetermined lowest position.

[0030] Finally, as can be appreciated by one in the art, the present invention also comprises a method for forming and using the display mount described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The objects, features and advantages of the present invention will be apparent from the following detailed descriptions of the various aspects of the invention in conjunction with reference to the following drawings, where:

[0032] FIG. **1** is an illustration of a prior art display mount;

[0033] FIG. **2** is an illustration of a prior art display mount;

[0034] FIG. **3** is an illustration of a prior art display mount;

[0035] FIG. **4** is an illustration of a display mount according to the present invention, depicting the display mount in a retracted position;

[0036] FIG. **5** is an illustration of a display mount according to the present invention, depicting the display mount in an extended position;

[0037] FIG. **6** is front, isometric-view illustration of a display mount according to the present invention, depicting the display mount in an extended position;

[0038] FIG. **7** is an illustration of a display mount according to the present invention, depicting a television or flat panel display mounted to the display mount;

[0039] FIG. **8** is a rear, isometric-view illustration of the display mount according to the present invention;

[0040] FIG. **9** is a front-view illustration of the display mount according to the present invention;

[0041] FIG. **10** is a side-view illustration of the display mount according to the present invention;

[0042] FIG. **11** is a schematic depicting an electrical circuit wiring diagram for one electrical aspect of the present invention;

[0043] FIG. **12** is a bottom-view illustration of the display mount according to the present invention;

[0044] FIG. **13** is a rear, isometric-view illustration of the display mount according to the present invention, depicting a manual version;

[0045] FIG. **14** is a side-view illustration of the display mount according to the present invention, depicting the manual version; and

[0046] FIG. **15** is a front, isometric view illustration of one aspect of the mounting plate component of the present invention.

DETAILED DESCRIPTION

[0047] The present invention relates to a display mount and, more particularly, to an adjustable flat-panel display mount for mounting the flat-panel to a surface and adjusting the viewing height and viewing direction of the flat-panel display. The following description is presented to enable one of ordinary skill in the art to make and use the invention and to incorporate it in the context of particular applications. Various modifications, as well as a variety of uses in different applications will be readily apparent to those skilled in the art, and the general principles defined herein may be applied to a wide range of embodiments. Thus, the present invention is not intended to be limited to the embodiments presented, but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

[0048] In the following detailed description, numerous specific details are set forth in order to provide a more thorough understanding of the present invention. However, it will be apparent to one skilled in the art that the present invention may be practiced without necessarily being limited to these specific details. In other instances, well-known structures and devices are shown in block diagram form, rather than in detail, in order to avoid obscuring the present invention.

[0049] The reader's attention is directed to all papers and documents which are filed concurrently with this specification and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference. All the features disclosed in this specification, (including any accompanying claims, abstract, and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is only one example of a generic series of equivalent or similar features.

[0050] Furthermore, any element in a claim that does not explicitly state "means for" performing a specified function, or "step for" performing a specific function, is not to be interpreted as a "means" or "step" clause as specified in 35 U.S.C. Section 112, Paragraph 6. In particular, the use of "step of" or "act of" in the claims herein is not intended to invoke the provisions of 35 U.S.C. 112, Paragraph 6.

[0051] Please note, if used, the labels left, right, front, back, top, bottom, forward, reverse, clockwise and counter clockwise have been used for convenience purposes only and are not intended to imply any particular fixed direction. Instead, they are used to reflect relative locations and/or directions between various portions of an object.

[0052] Before describing the invention in detail, an introduction provides the reader with a general understanding of the present invention. Thereafter, specific details of the present invention are provided to give an understanding of the specific aspects and details.

[0053] (1) Introduction

[0054] As noted above, a problem with display mounts of the prior art is that they do not allow for an attached display to move out and down. In other words, existing display mounts do not enable a mounted flat-panel display to move downwards while simultaneously moving the flat-panel display away from the mounting point to avoid a fireplace mantel or other fixtures or objects on the wall. Thus, the present invention is directed to a display mount for adjusting the height and distance of a flat-panel display from a wall. More particularly, the present invention is related to an adjustable flat-panel display mount that allows the flat-panel display to be adjusted out, up and down while using minimal force. The adjustable flat-panel display mount may also employ a counterbalancing mechanism.

[0055] For example and as depicted in FIGS. **4** and **5**, the present invention is a display mount **400** that can be adjusted vertically **402** and horizontally **404**. The display mount **400** can be mounted at any suitable location, such as on a wall surface **106** and/or over a fireplace mantel **302**. Due to its unique configuration, the display mount **400** enables a mounted flat-panel display **102** to move downwards while simultaneously moving the flat-panel display **102** away from the mounting point to avoid a fireplace mantel **302** or other fixtures or objects on the wall. The flat-panel display **102** can be lowered in front of the fireplace mantel **302** to a more comfortable viewing height **110** and viewing distance **116**. As shown in FIG. **4**, when the flat-panel display **102** is not being viewed or when the viewer **118** prefers to view the flat-panel display **102** at a higher viewing height **110**, it can be returned to a position above the mantel **302** and adjacent to the wall **106**.

[0056] From the foregoing, it will be appreciated that it would be an advancement in the art to provide a display mount **400** that can adjust the viewing height **110** of a flat-panel display **102** and also be practical for use over a fireplace mantel **302**. It would be a further advantage to provide such a display mount **400** that could be adjusted quickly and with minimal effort. Finally, it would be an additional advantage to provide a way to easily position the flat-panel display **102** at a predetermined height and position above the fireplace mantel **302** and at a lower height and position in front of the mantel **302**, or some position in between, for optimal viewing. Specific details of the present invention are provided below.

[0057] (2) Specific Details

[0058] As shown in FIG. **6**, the present invention is a display mount **400**. The display mount **400** includes a mounting plate **600** for attaching the display mount **400** to a mounting surface (such as a wall or piece of furniture). At the other end is a front mount **604** that is formed to attach with a television display. As a non-limiting example, the front mount **604** is a mounting plate that provides a mounting point for the television display.

[0059] A rear casing **602** is attached with the mounting plate **600** to provide support for one end of a swing out apparatus. Importantly, the swing out apparatus is pivotally connected with the mounting plate **600**, either directly or indirectly. If indirectly connected, the rear casing **602** is connected with and between the mounting plate **600** and the swing out apparatus.

[0060] The swing out apparatus is pivotally connected between the rear casing **602** and the front mount **604** and is operable for moving the front mount **604** in any suitable direction of linear and/or rotational motion, or any combination thereof. For example, the swing out apparatus is formed to swing the front mount **604** out and down. As a non-limiting example, the swing out apparatus is a set of bars **606** (or a set of pivotally connected plates), a counterbalancing mechanism (depicted in FIG. **8**), and electric and/or non-electric components used to control the extension and retraction of the display mount **400**. The set of bars **606** together with the mounting plate **600**/rear casing **602** and front mount **604**/

front casing **608**, form a four-bar linkage. Bars **606** are pivotally connected at one end to the rear casing **602** and at the other end to the front mount **604** (or an intermediate structure or connection, such as front casing **608** as described in further detail below). The swing out apparatus allows the front mount **604** to pivot out from a retracted position (as depicted in FIG. **4**) to an extended position (as depicted in FIGS. **5** and **6**). The set of bars **606** are pivotally connected using any suitable connection technique, a non-limiting example of which includes bolts and nuts attached through pivot point holes. It should be noted that although a rear casing **602** is described and depicted, in another aspect, the swing out apparatus could be directly connected with the mounting plate **600**. It should be noted that although front casing **608** is described and depicted, in another aspect, the swing out apparatus could be directly connected with front mount **604**.

[0061] The rear casing **602** and front casing **608** can be used to hold and conceal components, such as components depicted in the electrical circuit diagram and components in the manual (non-electrical) version described in further detail below.

[0062] A decorative cover **612** can be attached with the rear casing **602** and/or mounting plate **600** to camouflage/decorate the mounting plate **600** and rear casing **602**. This is important, as the rear casing **602** and mounting plate **600** may be visible when the display mount **400** is in the extended position.

[0063] A cable management plate **618** is incorporated into the front casing **608**. The cable management plate **618** serves to assist with cable management. It serves as a connection point for wires that are routed through the display mount **400** and then connect to other devices. It also serves as a connection point for extension cables carrying electronic signals and can serve as a hub for some types of cables. When used to connect power cables, it can serve as a power outlet for multiple devices, therefore, reducing the number of cables that are run from the devices mounted on the front mount **604** and electronic accessory bracket **614** to their power source (e.g., via a plug-in cord **610**). One aspect contains an opening to a conduit that is routed through the display mount **400**. This is beneficial in that any current or future connectors of an adequate size can be accommodated without committing to a specific connector type. In one aspect, the cable management plate **618** is incorporated into the front mount **604**. Additionally, the display mount **400** contains two cable management plates **618**, one that is incorporated into front casing **608** and one that is incorporated into mounting plate **600** or rear casing **602** with wires and/or a conduit connected between them.

[0064] Also depicted is an electronic accessory bracket **614**. The electronic accessory bracket **614** provides a mounting point for a variety of accessories, such as audio device accessories (e.g., center channel speaker, multiple speakers, speaker accessory, or microphone), video game accessories (e.g., video game console or video game interface accessory), internet accessories (e.g., video camera), and/or TV accessories. Further, as noted herein, the present invention provides a suitable mounting system for mounting a flat panel display above a fireplace mantel. In operation, heat can be generated from an operating fireplace that would rise and could possibly damage the flat panel display. Thus, it may be desirable to include a heat shield. In this aspect, a heat shield mount **616** is included. The heat shield mount **616** can be formed to operate as a heat shield or can serve as a mounting point upon which a heat shield can be attached.

[0065] For further understating, FIG. **7** depicts the display mount **400** with a flat-panel display **102** attached to the front mount **604** using mounting brackets **710**. The electronic accessory bracket **614** allows for accessories to be mounted such that they clear the top of the flat-panel display **102**. Also depicted is a heat shield **700** that is attached with the heat shield mount **616**. In one aspect, a retractable heat shield, similar to a retractable window shade, can be affixed between the heat shield mount **616** and the bottom of the rear casing **602**.

[0066] FIG. **8** depicts a rear-view of an electric version of the display mount **400**. In this aspect, the display mount **400** includes any suitable mechanism or device that allows for automated motion. As a non-limiting example, a linear actuator **810** is attached to two points on the four-bar linkage (composed of the set of bars **606**, mounting plate **600**/rear casing **602**, and front mount **604**/front casing **608**), such that when the linear actuator **810** is extended or retracted, the front mount **604** pivots to the extended position (as depicted in FIG. **4**) or the retracted position (as depicted in FIGS. **5** and **6**) or some point in between. The extended or retracted position of the linear actuator **810**, and hence the position of front mount **604**, can be controlled via a control switch **812** mounted onto the front casing **608** or any other easily accessible location. In one aspect, the linear actuator **810** can be substituted with a winch mechanism that is attached between the rear casing **602** and front casing **608**. The winch mechanism can release or retract a section of wire such that together with the gravitational force, the front casing **608** can be adjusted from the retracted position to the extended position or any point in between.

[0067] The display mount **400** may include a counterbalancing mechanism **820**. As a non-limiting example, the counterbalancing mechanism can be comprised of any combination or number of tension springs, torsion springs, or gas springs. The counterbalancing force will be substantially equal to the gravitational force exerted by a flat-panel display that is mounted on the display mount **400** such that display mount **400** can be extended or retracted with minimal force when a flat-panel display is attached to it.

[0068] FIG. **9** depicts the front-view of the display mount **400** in the retracted position. When the display mount **400** is in the retracted position, the display will conceal most of the mount **400**. The control switch **812** may be exposed along with the electronic accessory bracket **614** and heat shield mount **616**.

[0069] FIG. **10** depicts the side-view of the display mount **400** in the retracted position. The heat shield mount **616** provides protection for the display mount **400** and the flat panel display from heat while allowing access to the control switch **812**. As shown, the two bars **606** depicted are positioned one directly above the other. In one aspect, the top and bottom bars **606** are offset such that they can rotate with reduced interference from each other and the display mount **400** can be retracted more compactly.

[0070] FIG. **11** is a schematic depicting an electrical circuit wiring diagram for one electrical aspect of the present invention. The display mount **400** can be extended or retracted by either pressing a switch incorporated into the display mount **400**, a first switch SW**1** (referred to as control switch **812** above), or by pressing a switch on a Remote Control **1100** that wirelessly communicates with a Remote Control Unit **1102**. Switch SW**1** is a double-pole double-throw switch, which can be wired to operate the Linear Actuator **810** in either polarity.

For example, when the switch SW1 is pressed to one position, the Linear Actuator **810** extends and when the switch SW1 is pressed to the other position, the Linear Actuator **810** retracts. SW1 is biased towards an open position, which prevents the Linear Actuator **810** from being energized (or from moving) when force is not being applied to switch SW1 and simultaneously yields control to the Remote Control Unit **1102**. When the Remote Control Unit **1102** is enabled and it receives a "extend" or "retract" signal from the Remote Control **1100**, the Remote Control Unit **1102** will energize the Linear Actuator **810** in the appropriate polarity and cause it to extend or retract. The relays (Relay1, Relay2, and Relay3) ensure that the Linear Actuator **810** is energized through only one path of the circuit, either through the path of switch SW1 or through the path of the Remote Control Unit **1102**. A second switch SW2 provides a setting for the Remote Control Unit **1102**, making control of the Linear Actuator **810** either momentary or latching (momentary energizes the Linear Actuator **810** only while a button on the Remote Control Unit **1102** is pressed, latching energizes the Linear Actuator **810** with just one pulse of a button on the Remote Control **1100** and moves the Linear Actuator **810** until it reaches one of its two extreme positions—either fully extended or fully retracted). In this way, separate switches (SW1 and those on the Remote Control **1100**) can seamlessly share control of the display mount **400**. Switch SW1 has precedence over the control of the Linear Actuator **810**.

[0071] FIG. **12** is a schematic depicting the bottom-view of the display mount **400**. It should be noted that for visual clarity, the heat shield is not illustrated in FIG. **12**. The control switch **812** can be positioned at any suitable location, as a non-limiting example, the control switch **812** is positioned on the front casing **608** facing down for easy access. The rear casing **602** and front casing **608** come together when the display mount **400** is in the retracted position. In one aspect, the front casing **608** is broader than rear casing **602**. When the display mount **400** reaches the retracted position, the front casing **608** straddles rear casing **602**. Since the two pieces do not necessarily come in contact, this provides more flexibility with part tolerances. This also provides more options for the placement of bars **606**. They can be placed outside both rear casings (rear casing **602** and front casing **608**), inside one casing and outside the other, inside both casings, or any combination thereof.

[0072] FIG. **13** is a schematic depicting the rear, isometric-view of a manual version of the display mount **400**. As can be appreciated by one skilled in the art, in addition to being automated, the display mount **400** can be formed to be manually operated, as depicted in FIG. **13**. Although optional accessories (such as the heat shield, electronic accessory bracket, cable management plate and decorative cover) are not depicted in FIG. **13**, it should be understood that they can also be attached or built into the manual version of the display mount **400**. The manual version includes a lockable telescoping cylinder assembly to allow extension and retraction of the display mount **400**. The lockable telescoping cylinder assembly performs a similar function to the linear actuator **810** as shown in FIG. **8**; as the lockable telescoping cylinder assembly is extended or retracted, the four-bar linkage is distorted to extend or retract the display mount **400**. A non-limiting example of a suitable lockable telescoping cylinder assembly includes an outer cylinder **1310**, an inner cylinder **1320**, an adjustment lever **1330**, and a lock biasing spring **1340**. The inner cylinder **1320** is made to easily slide back and forth inside the outer cylinder **1310** and the two parts are shaped, or keyed, so that they cannot rotate with respect to each other. In addition, both the inner cylinder **1320** and the outer cylinder **1310** are shaped to include one or more stops to prevent the display mount from being positioned beyond predetermined fully retracted or fully extended positions. The adjustment lever **1330** is pivotally attached to the outer cylinder **1310** and includes a locking pin **1360** that locks the lockable telescoping cylinder assembly when the locking pin **1360** is inserted into any one of several spaced apertures on inner cylinder **1320**. The outer cylinder **1310** includes an opening on its side that allows the locking pin **1360** to be inserted into the apertures on the inner cylinder. The lock biasing spring **1340** is attached to the adjustment lever **1330** and the outer cylinder **1310** and biases the lockable telescoping cylinder assembly towards the locked position. The adjustment handle **1350** can be used to adjust the display mount **400** and position the flat-panel display **102** in the desired location.

[0073] Both the electric and manual versions of the display mount **400** may include a counterbalancing mechanism **820**.

[0074] FIG. **14** is a schematic depicting the side-view of the manual version of the display mount **400**. To operate the manual version, one end of the adjustment lever **1330** is pulled towards the adjustment handle **1350**, thus unlocking the lockable telescoping cylinder assembly. The swing out apparatus can then be adjusted to the extended position, retracted position, or some point in between.

[0075] FIG. **15** is a depiction of one aspect of the mount plate **600** which is formed for optional in-wall installation. In this aspect, the mount plate **600** includes selectively positionable leaves **1400**. The selectively positionable leaves **1400** are formed such that they can be selectively positioned between being substantially planar with a back portion **1500** of the mount plate **600** or perpendicular to the back portion **1500** of the mount plate **600** (or any relative position therebetween). A non-limiting example of such leaves **1400** includes two hinged side plates that are each pivotally attached with back portion **1500** that together form the mount plate **600**. The rear casing **602** is shown to help establishing the orientation of the mount plate **600**. When mounting the display mount **400** on a wall, the leaves **1400** can be turned to install the display mount **400** between two wall studs. By installing between the wall studs, the display mount **400** will not protrude away from the wall surface as much. This minimizes or eliminates the visible profile of the display mount **400**.

What is claimed is:

1. A display mount, comprising:

a mounting plate for mounting with a surface;

a front mount formed to attach with a flat-panel display; and

a swing out apparatus pivotally connected between the mounting plate and the front mount, the swing out apparatus formed to swing the front mount between a retracted position and an extended position, such that motion from the retracted to extended position moves the front mount out and down.

2. The display mount as set forth in claim **1**, wherein the swing out apparatus includes a set of bars that, together with the mounting plate and front mount, form a bar linkage.

3. The display mount as set forth in claim **2**, further comprising a rear casing connected to and between the mounting plate and the swing out apparatus.

4. The display mount as set forth in claim **3**, further comprising a front casing connected to and between the swing out apparatus and the front mount.

5. The display mount as set forth in claim **4**, further comprising a heat shield connected with the front mount.

6. The display mount as set forth in claim **5**, further comprising a linear actuator attached with the swing out apparatus to swing the front mount between a retracted position and an extended position.

7. The display mount as set forth in claim **6**, further comprising a first switch attached with the front casing, the first switch operably connected with the linear actuator to allow for control of the linear actuator.

8. The display mount as set forth in claim **7**, wherein the first switch is a double-pole, double-throw switch, which is wired to operate the linear actuator in both positive and negative polarities.

9. The display mount as set forth in claim **8**, further comprising a remote control unit that is operably connected with the linear actuator, the remote control unit being controlled wirelessly via a remote control to receive extend and retract signals from the remote control, such that upon actuation of the remote control, the remote control unit energizes the linear actuator in the appropriate polarity to cause it to extend or retract.

10. The display mount as set forth in claim **9**, wherein the first switch is biased towards an open position to prevent the linear actuator from being energized when force is not being applied to the first switch and simultaneously yielding control to the remote control unit.

11. The display mount as set forth in claim **10**, wherein the swing out apparatus further comprises a counterbalancing mechanism, the counterbalancing mechanism providing a counterbalancing force that is substantially equal to a gravitational force exerted by a flat-panel display when mounted on the display mount.

12. The display mount as set forth in claim **1**, further comprising a rear casing connected to and between the mounting plate and the swing out apparatus.

13. The display mount as set forth in claim **1**, further comprising a front casing connected to and between the swing out apparatus and the front mount.

14. The display mount as set forth in claim **1**, further comprising a heat shield connected with the front mount.

15. The display mount as set forth in claim **1**, further comprising a linear actuator attached with the swing out apparatus to swing the front mount between a retracted position and an extended position.

16. The display mount as set forth in claim **15**, further comprising a first switch attached with the display mount, the first switch operably connected with the linear actuator to allow for control of the linear actuator.

17. The display mount as set forth in claim **16**, wherein the first switch is a double-pole, double-throw switch, which is wired to operate the linear actuator in both positive and negative polarities.

18. The display mount as set forth in claim **15**, further comprising a remote control unit that is operably connected with the linear actuator, the remote control unit being controlled wirelessly via a remote control to receive extend and retract signals from the remote control, such that upon actuation of the remote control, the remote control unit energizes the linear actuator in the appropriate polarity to cause it to extend or retract.

19. The display mount as set forth in claim **18**, further comprising a first switch attached with the display mount, the first switch operably connected with the linear actuator to allow for control of the linear actuator, and wherein the first switch is biased towards an open position to prevent the linear actuator from being energized when force is not being applied to the first switch and simultaneously yielding control to the remote control unit.

20. The display mount as set forth in claim **1**, wherein the swing out apparatus further comprises a counterbalancing mechanism, the counterbalancing mechanism providing a counterbalancing force that is substantially equal to a gravitational force exerted by a flat-panel display when mounted on the display mount.

21. The display mount as set forth in claim **1**, wherein the mounting plate has a back portion and selectively positionable leaves, the selectively positionable leaves being formed such that they can be selectively positioned between being substantially planar with a back portion of the mount plate or perpendicular to the back portion of the mount plate, or any relative position therebetween.

22. The display mount as set forth in claim **1**, further comprising a lockable telescoping cylinder assembly attached with the swing out apparatus to swing the front mount between a retracted position and an extended position.

23. The display mount as set forth in claim **22**, wherein the lockable telescoping cylinder assembly further comprises:

adjustment lever to unlock the lockable telescoping cylinder assembly;

adjustment handle to operate and adjust the display mount;

a lock biasing spring formed to bias the adjustment lever in the locked position;

a counterbalancing mechanism formed to provide a sufficient holding force to hold the display mount and attached flat-panel display at a fully extended or fully retracted position and points in between; and

at least one adjustment stop attached to the lockable telescoping cylinder assembly such that when the front mount is at a predetermined lowest position, the swing out apparatus engages the adjustment stop, thereby preventing the front mount from being positioned below the predetermined lowest position.

24. A display mount, comprising:

a mounting plate for mounting with a surface, the mounting plate having a back portion and selectively positionable leaves, the selectively positionable leaves being formed such that they can be selectively positioned between being substantially planar with a back portion of the mount plate or perpendicular to the back portion of the mount plate, or any relative position therebetween; and

a front mount formed to attach with a flat-panel display; and

a swing out apparatus pivotally connected between the mounting plate and the front mount, the swing out apparatus formed to move the front mount in a motion selected from a group consisting of linear motion and rotational motion, or any combination thereof.

25. The display mount as set forth in claim **24**, wherein the selectively positionable leaves are hinged side plates that are pivotally connected with the back portion of the mounting plate.

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