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Television mounting systems

Abstract

A mounting system capable of mounting objects to support structures. The mounting system includes a wall mount including a display bracket configured to hold the object, a fixed support bracket coupleable to a vertical support structure, and a linkage assembly. The linkage assembly has a low-profile stowed configuration in which the object is held in a raised position close to the support structure. The linkage assembly moves to another configuration to move the object. The object can be held in a lowered position. A biasing mechanism can facilitate convenient movement of the object.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation of U.S. patent application Ser. No. 18/244,201, filed Sep. 8, 2023, which is a continuation of U.S. patent application Ser. No. 18/109,220, filed Feb. 13, 2023, now U.S. Pat. No. 11,856,317, which is a continuation of U.S. patent application Ser. No. 17/587,792, filed Jan. 28, 2022, now U.S. Pat. No. 11,607,042, which is a continuation of U.S. patent application Ser. No. 17/516,287, filed Nov. 1, 2021, which is a continuation of U.S. patent application Ser. No. 16/370,841, filed Mar. 29, 2019, now U.S. Pat. No. 11,178,354, which is a continuation of U.S. patent application Ser. No. 16/101,345, filed Aug. 10, 2018, now U.S. Pat. No. 10,277,860, which is a continuation of U.S. patent application Ser. No. 15/851,510, filed Dec. 21, 2017, now U.S. Pat. No. 10,257,460, which is a continuation of U.S. patent application Ser. No. 14/229,780, filed Mar. 28, 2014, now U.S. Pat. No. 9,876,984, which is a continuation of U.S. patent application Ser. No. 13/118,297, filed May 27, 2011, now U.S. Pat. No. 8,724,037, which claims benefit of U.S. Provisional Patent Application No. 61/396,850, filed Jun. 4, 2010, which are all incorporated herein by reference in their entireties.

TECHNICAL FIELD
(1) The present invention relates generally to mounting systems. More specifically, the invention relates to mounting systems for mounting objects to structures.
BACKGROUND OF TECHNOLOGY
(2) Televisions are often mounted directly to walls using wall mounts. Tilting wall mounts and full motion wall mounts are two types of mounts that allow movement of the television. Tilting wall mounts often allow tilting about a horizontal axis of rotation. Unfortunately, if tilting wall mounts are installed at relatively high locations, there may be limited viewing because ideal viewing often requires that the center of the screen be level with a viewer's eyes. Full motion wall mounts often allow movement of the television away from walls, swiveling of the television, and/or tilting of the television. If either a tilting wall mount or a full motion wall mount is installed above a fireplace, the mounted television is often much higher than a sitting viewer's eyes and, thus, may not provide comfortable viewing.
SUMMARY
(3) At least some embodiments are directed to mounts capable of holding and moving objects. Mounted objects can be held at relatively high locations to keep the objects out of the way when stowed. Mounted objects can be conveniently moved to a desired position.
(4) In certain embodiments, a wall mount can hold an electronic display in the form of a television. The wall mount can be installed above a fireplace or other aesthetically pleasing location. A user can manually or automatically lower the television such that the television is generally in front of the fireplace. A viewer's eyes can be generally level with the center of the screen. The television can be panned, tilted (e.g., rotated about a generally horizontal axis), and/or swiveled (e.g., rotated about a generally vertical axis) to accommodate different viewing positions. Pivots, swivels (e.g.,

swivel brackets), joints, or the like can be used to provide the desired motion. The television can range in weight from about 20 pounds to about 110 pounds.

(5) A mounting system, in some embodiments, comprises a wall mount including a bracket configured to hold an object, a fixed support bracket coupleable to a vertical support structure, and a linkage assembly. The linkage assembly has a low-profile stowed configuration in which the object is held close to the support structure. The linkage assembly is movable to an expanded configuration to reposition the object at different heights. A biasing mechanism can facilitate movement of the object and, in some embodiments, can be in the form of a counterbalance mechanism.

(6) In some embodiments, a wall mount includes a low-profile parallel mechanism in the form of a four bar linkage configured to store an object at a raised, low profile position close to the wall (e.g., within 5 inches of the wall). The mounted object can be moved away from the raised position along a path (e.g., an arcuate path, partially circular path, curved path, partially elliptical path, or the like). The four bar linkage can include a fixed linkage that connects to a main load bearing linkage through a pivot, which connects to an object mounting linkage through a pivot, which connects to an adjustable length linkage through a pivot, which connects back to the fixed linkage through a pivot. In certain embodiments, the fixed linkage is a support bracket, and the object mounting linkage is a display bracket.

(7) One or more biasing mechanisms allow for controlled movement of the mounted object. Biasing mechanisms can be counterbalance mechanisms that are adjustable to vary balancing forces to counterbalance a wide range of different types of objects based on one or more criteria, including user preferences (e.g., a desired force required to move the object). Additionally or alternatively, a locking mechanism (e.g., a locking knob, a clamp, a pin, etc.) allows the user to lock at least one pivot, thereby allowing the object to be kept at any desired position. A tilt setting mechanism can be used to change the length of one or more links to adjust the tilt of the object. If the object is an electronic display held at a relatively high position, a tilt setting mechanism can be used to angle the electronic display downwardly such that a viewer's line of sight is generally perpendicular to the screen. As the display is lowered, the screen can be tilted to ensure that the screen remains generally perpendicular to the viewer's line of sight.

(8) As the display moves towards the raised or up position, one of the pivots can move past a line extending between upper pivots and lower pivots, preferably pivots defined by a fixed linkage. Such an over-center configuration allows automatic locking of the mount into a low-profile configuration. A downwardly direct force applied to the display will not cause deploying of the wall mount. However, the display can be pulled away from the wall to release the wall mount. For example, a horizontally directed force (a force directed away from the wall) applied to the bottom of the display can cause the wall mount to unlock and deploy.

(9) A mounting system, in some embodiments, includes a four bar linkage configured such that the mounted object tilts backward as the object moves downwardly. If the object is an electronic display, the screen can be substantially normal to someone looking at it, irrespective of the height of the electronic display. As the electronic display is raised, the electronic display can tilt forward until the electronic display is substantially parallel to the wall or at another desired orientation.

(10) In some embodiments, a system comprises a low-profile wall mount including a display bracket configured to couple to a large screen television, a support bracket configured to couple to a wall, and a linkage assembly. The linkage assembly is rotatably coupled to the display bracket and rotatably coupled to the support bracket. The linkage assembly includes a first link and a second link extending alongside at least a portion of the first link when the linkage assembly is in a collapsed, low-profile stowed configuration, and in an upright position, so as to hold the large screen television in a raised position close to the wall. The second link is configured to be moved away from and substantially parallel to the first link as the linkage assembly moves away from the collapsed, low-profile stowed configuration so as to move the television to a lowered position

which is close to a portion of the wall beneath the support bracket. The system further includes a biasing mechanism configured to counterbalance the weight of the large screen television. The biasing mechanism includes a force adjustment mechanism operable to increase or decrease a balancing force provided by the biasing mechanism to counterbalance different weights of different televisions.

(11) The wall mount, in some embodiments, includes an upper outer pivot coupling an outer end of an upper link of the linkage assembly to the display bracket, a lower outer pivot coupling an outer end of a lower link of the linkage assembly to the display bracket, an upper inner pivot coupling an inner end of the upper link to the support bracket, and a lower inner pivot coupling an inner end of the lower link to the support bracket. An upper outer axis of rotation is defined by the upper outer pivot. A lower inner axis of rotation is defined by the lower inner pivot. A lower outer axis of rotation is defined by the lower outer pivot that is movable across an imaginary plane to move the linkage assembly from the collapsed, low-profile stowed configuration to a deployed configuration to lower the television. The upper outer axis of rotation and the lower inner axis of rotation lay in an imaginary plane when the linkage assembly is in the collapsed, low-profile stowed configuration.

(12) In yet other embodiments, a system includes a low-profile mounting system for holding an electronic display. The low-profile mounting system includes a display bracket configured to hold the electronic display, a fixed support bracket coupleable to a vertical support structure, and a linkage assembly rotatably coupled to the display bracket and rotatably coupled to the fixed support bracket. The linkage assembly has a collapsed stowed configuration in which the linkage assembly is in a substantially upright position to hold the electronic display in a stowed position, an expanded configuration in which the linkage assembly extends substantially horizontally away from the fixed support bracket, and a lowered configuration in which the linkage assembly extends downwardly away from the fixed support bracket to hold the electronic display in a lowered position.

(13) In some embodiments, the linkage assembly can be positioned to define an angle of declination of at least about 5 degrees. For example, the angle of declination can be in a range of about 5 degrees to about 90 degrees. If the mount is positioned above a mantel, the maximum angle of angle of declination can be about 60 degrees. Other angles are also possible.

(14) The linkage assembly can be configured to substantially maintain a tilt of the electronic display as the linkage assembly lowers the electronic display. In some embodiments, the electronic display remains parallel to the vertical support structure as the electronic display is lowered. In other embodiments, the electronic display tilts slightly as it is lowered.

(15) In yet further embodiments, a mounting system includes a display bracket for holding a display, a fixed support bracket, and a linkage assembly. The linkage assembly is rotatably coupled to the fixed support bracket and carries the display bracket. The linkage assembly is reconfigurable to move a display held by the display bracket from a stowed position to a lowered position while keep the display in a substantially vertical orientation. A top of the display is lower than a top of the fixed support bracket when the display is in the lowered position.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) Non-limiting and non-exhausting embodiments are discussed with reference to the following drawings. The same reference numerals refer to like parts or acts throughout the various views, unless specified otherwise.

(2) FIG. **1** is an isometric view of a television held by a mounting system connected to a wall.

(3) FIG. **2** is a pictorial view of a television installed above a fireplace.

(4) FIG. **3** shows the television in a lowered position in front of the fireplace.
(5) FIG. **4** is an isometric view of a mounting system, in accordance with one embodiment.
(6) FIG. **5** is a top plan view of the mounting system of FIG. **4**.
(7) FIG. **6** is a side elevational view of the mounting system of FIG. **4**.
(8) FIG. **7** is an isometric view of the mounting system with an upper arm shown removed.
(9) FIG. **8** is a cross-sectional view of the mounting system taken along a line **8-8** of FIG. **5**.
(10) FIG. **9** is a side elevational view of the mounting system in a stowed configuration.
(11) FIG. **10** is a side elevational view of the mounting system in a deployed expanded configuration.
(12) FIG. **11** is a side elevational view of a television in a lowered position.
(13) FIG. **12** is a top plan view of the stowed mounting system.
(14) FIG. **13** is a side elevational view of the stowed mounting system of FIG. **12** holding a television.
(15) FIG. **14** is a back elevational view of the stowed mounting system of FIG. **12**.
(16) FIG. **15** is a front elevational view of the stowed mounting system of FIG. **12**.
(17) FIG. **16** is a side elevational view of the stowed mounting system holding a television generally parallel relative to a wall.
(18) FIG. **17** is a side elevational view of the stowed mounting system holding a television tilted downwardly.
(19) FIG. **18** is an isometric view of a mounting configuration.
(20) FIG. **19** is a side elevational view of the mounting system of FIG. **18** in a stowed configuration.
(21) FIG. **20** is a detailed view of a positioner of FIG. **19**.
(22) FIG. **20**A is a detailed view of the positioner in an extended configuration.
(23) FIG. **21** is a side elevational view of the mounting system of FIG. **18** in a deployed configuration.
(24) FIG. **22** is a detailed view of the positioner of FIG. **21**.
(25) FIG. **23** is a side elevational view of the mounting system of FIG. **18** holding a television at a lowered position.
(26) FIG. **24** is a detailed view of the positioner.
(27) FIG. **25** is a top plan view of the mounting system of FIG. **18**.
(28) FIG. **26** is a rear, top, and left side isometric view of the mounting system of FIG. **25**.
(29) FIG. **27** is a top plan view of a mounting system, in accordance with another embodiment.
(30) FIG. **28** is a side elevational view of a motorized mounting system, in accordance with one embodiment.

DETAILED DESCRIPTION

(31) FIG. **1** shows a mounting system in the form of a wall mount **100** carrying an electronic display in the form of a flat screen television **110**. A collapsible linkage assembly **130** is connected to a support bracket **140** that is mounted to a support structure in the form of a wall **120**. The linkage assembly **130** can swing upwardly (indicated by an arrow **150**) or downwardly (indicated by an arrow **152**). An adjustment mechanism **146** is operable to adjust a biasing force provided by a biasing mechanism to allow for controlled movement of the television **110**. Once the television **110** is at a desired position, the biasing mechanism keeps the television **110** stationary.
(32) FIG. **2** shows the television **110** in a raised, stowed position and very close to the wall **120**. The wall mount **100** is hidden from view of someone in front of the television **110** for an aesthetically pleasing appearance. Advantageously, it may be difficult for small children to reach up and pull down on the television **110**. The illustrated stowed television **110** is positioned above a fireplace to avoid occupying usable space and to reduce the likelihood of unwanted inadvertent contact by people moving about the room. If the fireplace includes a hearth, it may be difficult for small children, or other individuals, to inadvertently contact the television **110**.

(33) The television **110** can swing downwardly and, if desired, can be positioned in front of the fireplace, as shown in FIG. **3**. The lowered television **110** can be positioned very close to the front of the fireplace. Viewer's eyes can be generally level with a center of a screen **160**. The lowered television **110** is especially well suited for viewing when someone is positioned near the television **110**, for example, to play a game system (e.g., Xbox 360, PlayStation®, PlayStation®2, PlayStation®3, Nintendo game system, or the like), or to provide convenient viewing while sitting, for example, on furniture or on the floor. After viewing, television **110** can be returned to the stowed position.

(34) Referring again to FIG. **2**, a top **132** of the stowed television **110** can be angled forwardly such that the screen **160** is substantially perpendicular to a sitting viewer's line of sight. Alternatively, television **110** can be flat against the wall **120** (e.g., parallel to the wall **120**) to minimize or limit unwanted reflections from the screen **160** that may be directed to someone sitting on furniture in front of the television **110**, especially when the television **110** is turned OFF. The wall mount **100** can automatically tilt the television **110** as the television **110** moves vertically. As the television **110** is lowered, it is tilted to keep the screen **160** substantially perpendicular relative to the viewer's line of sight. Once the television **110** is at a desired position, the television **110** can be further tilted using a tilt mechanism, if needed or desired.

(35) In some manually deployable embodiments, a user can conveniently grasp and pull the television **110** away from the wall **120**. The television **110** will move forward a significant distance before it starts to move down a significant distance such that the television **110** can be brought down and in front of a protruding object below the support bracket **140**, illustrated in FIGS. **2** and **3** as a fireplace mantel **124**. The top **132** of the television **110** can be lower than a top **141** of the support bracket **140** and, in some embodiments, is positioned lower than a bottom **143** of the support bracket **140**. One or more adjustable fixed stops can be used to prevent contact with the mantel **124** or to achieve repeatable positioning, or both.

(36) The wall mount **100** can be coupled to a wide range of different types of support structures, such as walls of a dwelling (e.g., a house, an apartment, etc.), an office, a lobby, a bar (e.g., a sports bars), or the like and can be mounted to vertical walls or non-vertical walls, including, without limitation, angled walls, non-planar walls, or other structures sturdy enough to handle the load of the wall mount **100** and any attached object(s).

(37) The television **110** can be, without limitation, a liquid crystal display (LCD) television, a plasma television, a light emitting diode (LED) television, or other type of flat screen television, as well as other types of wall mountable televisions. The weights of such televisions are often in a range of about 20 lbs. to about 110 lbs. and often have a maximum thickness less than about 5 inches. Advantageously, large screen televisions have a screen with a length (measured diagonally) equal to or greater than about 30 inches and can hide the entire wall mount **100**, as shown in FIG. **2**. The wall mount **100** can also hold small or medium screen televisions. Other types of electronic displays (e.g., monitors) or objects can be carried by the wall mount **100**. Exemplary mountable objects include, but are not limited to, screens suitable for use with front projectors, boards (e.g., a chalk board, a dry erase board, etc.), containers (e.g., a basket, a bin, or the like), or the like.

(38) FIGS. **4-6** show the support bracket **140**, a display bracket **210**, and the linkage assembly **130** that cooperate to define a four bar linkage. Support bracket **140** includes a pair of spaced apart elongate members **170**, **172**, each including a plurality of apertures for receiving fasteners, such as fasteners **174** in FIG. **1**. As used herein, “bracket” is a broad term that includes one-piece or multi-piece structural supports configured to be coupled (e.g., fixedly coupled) to a support surface or structure. Brackets can be made, in whole or in part, of metal (e.g., steel, aluminum, etc.), composites, plastic, polymers, combinations thereof, or the like. In one-piece embodiments, a bracket can be formed using a stamping process, a machining process, or the like. In multi-piece embodiments, separate pieces can facilitate packaging for shipping. The pieces can be assembled after unpacking. Other types of one-piece or multi-piece brackets can be used, if needed or desired.

(39) Referring to FIGS. **4** and **5**, wall mount **100** is symmetrical with respect to a center plane **173** and, thus, may be described with reference to one side. A main bearing member in the form of an upper link **176** is rotatable about an upper axis of rotation **180** defined by support pivots **190**. A pair of lower links **178***a*, **178***b* (collectively "178") are rotatable about a lower axis of rotation **182** defined by support pivots **192**. The axes of rotation **180**, **182** can lie in an imaginary plane which is substantially parallel to the wall **120**.
(40) The upper link **176** includes a support end **200** and an opposing bracket end **204**. Pivots **190** couple the support end **200** to the bracket **140**. Pivots **211** couple the bracket end **204** to the display bracket **210**. The upper link **176** has a fixed length and a generally U-shaped transverse cross-section taken generally perpendicular to its longitudinal axis **177**. Sidewalls **216**, **217** are connected to an upper plate **218**.
(41) The lower links **178** are generally similar to one another and, accordingly, the description of one lower link applies equally to the other, unless indicated otherwise. The lower link **178***a* includes a support bracket end **222** rotatably coupled to the support bracket **140** by the pivot **192**. FIG. **6** shows a pivot **230** coupling the display bracket end **224** to the display bracket **210** and defining an axis of rotation **183**.
(42) With reference to FIG. **6**, the link **178***a* includes rigid slotted members **232**, **234** and pins extending through the members **232**, **234**. The slotted members **232**, **234** are slidable relative to one another. An adjustment mechanism in the form of a tilt adjustment mechanism **240** is slidably retained in a slot of the member **232** and a hole in the member **234**. A handle **242** can be rotated to lock and unlock the link **178***a*. To lengthen the link **178***a*, the handle **242** is rotated counter-clockwise and the member **232** is slid away from the support bracket **140**, as indicated by an arrow **246**. The length of the link **178***a* can be increased to rotate the display bracket **210** clockwise (indicated by an arrow **254**) about a tilt axis of rotation **250** (FIG. **5**) defined by the pivots **211**. The display bracket **210** can be rotated counter-clockwise about the tilt axis of rotation **250** (indicated by an arrow **256**) by sliding the member **232** in the opposite direction. After the television **110** is in the desired orientation, the handle **242** is rotated clockwise to securely hold the member **232** between the member **234** and the handle **242**. The dimensions (e.g., the longitudinal lengths) of the slots can be increased or decreased to increase or decrease the amount of tilt. Other locking mechanisms can include, without limitation, one or more rollers, slides (e.g., linear slides), locks, clamps, pins, ratchet mechanisms, or combinations thereof that cooperate to prevent, limit, or inhibit relative movement between components.
(43) Referring to FIGS. **4** and **5**, display bracket **210** includes a rail **270** and elongate arms **272**, **274** hanging on the rail **270**. The arms **272**, **274** can be slid along the rail **270**, as indicated by arrows **276**, **277**, **278**, **279**, to accommodate different sized objects. Fasteners **275**, **276** fixedly couple the elongate arms **272**, **274** to the rail **270**. Fasteners can pass through apertures in the elongate arms **272**, **274** to hold the television **110**. Other types of display brackets can also be used. The configuration, size, and design of the display bracket can be selected based on the configuration, size, and design of the television or other object to be mounted.
(44) FIG. **7** shows the wall mount **100** with the upper link removed. A biasing mechanism in the form of a counterbalance mechanism **300** cooperates with the linkage assembly **130** to allow a user to effortlessly move the television to different positions but prevents or inhibits movement of the television when the user does not apply a force. The television can be moved using a force that is less than a threshold force. The threshold force can be about 2 lbf., 3 lbf., 5 lbf., 10 lbf., or 20 lbf., as well as any other suitable threshold force. In some embodiments, counterbalance mechanism **300** counterbalances the weight of the television and the weight of the suspended components in order to allow movement with a desired amount of resistance (e.g., a minimal amount of resistance, a threshold amount of resistance, etc.). The counterbalance mechanism **300** can include force balancing devices, illustrated as pistons **310**, **320** rotatably coupled to the display bracket **210** and support bracket **140**. The pistons **310**, **320** can be gas pistons, pneumatic pistons, or other type of

biasing devices capable of providing a desired force, including, without limitation, a substantially constant force, variable force, or the like.
(45) Referring to FIGS. **7** and **8**, force adjustment mechanism **146** includes a threaded rod **330** held by holders **338**, **340** of the support bracket **140**. The rod **330** can be rotated to move a carriage **332** upwardly or downwardly. The carriage **332** is rotatably coupled to the counterbalance mechanism **300** and can be in a first position such that the counterbalance mechanism **300** is in a first setting or configuration to provide a first balancing force. The carriage **332** can be moved to a second position such that the counterbalance mechanism **300** is in a second setting or configuration to provide a second balancing force that is substantially different from the first balancing force. For example, the first balancing force can counterbalance a television that weighs about 100 pounds wherein the second balance force can counterbalance a television that weighs about 40 pounds. Other types of force adjustment mechanisms can include, without limitation, one or more motors (e.g., stepper motors), linear slides, threaded rods, pulleys, combinations thereof, or the like.
(46) FIGS. **9**, **10**, and **11** show the television **110** in a stowed position, an intermediate position, and a lowered position, respectively. The linkage assembly **130** of FIG. **9** is in a substantially upright position. The lower links **178** move away from and remain substantially parallel to the upper link **176** as the television **110** moves away from the wall **120**. FIG. **10** shows the linkage assembly **130** in an expanded configuration and extending substantially horizontally away from the support bracket **140**. FIG. **11** shows the linkage assembly **130** in a lowered configuration and extending downwardly away from the support bracket **140**. Details of the illustrated positions are discussed below.
(47) Referring to FIG. **9**, wall mount **100** has a relatively low-profile configuration to minimize a distance D between the television **110** and the support surface **120**. In some embodiments, distance D is less than about 8 inches, 6 inches, 5 inches, 4 inches, or 2 inches. Other distances Dare also possible. The upper link **176** and lower links **178** nest together to provide a space saving and aesthetically pleasing low profile configuration.
(48) As the television **110** is moved downwardly along a path **331**, it can tilt backwardly (e.g., rotate clockwise as viewed from the side) such that the screen is angled upwardly, as illustrated in FIGS. **10** and **11**. The wall mount **100** can also be modified to be a five bar linkage to provide such motion. The television **110** of FIG. **11** is especially well positioned for viewers with their heads positioned slightly above the center of the screen. Alternatively, television **110** can be moved along the path **331** without appreciably changing the tilt setting. For example, the center gravity (CG) of the television **110** can travel along the generally arcuate path **331** without appreciable rotation or angular displacement of the television **110**. Thus, television **110** can be translated or rotated, or both.
(49) The upper link **176** and lower links **178** can rotate about respective axes of rotation **182**, **180** from about 130 degrees to about 180 degrees. In some embodiments, the upper link **176** and lower links **178** rotate about the respective axes of rotation **182**, **180** about 160 degrees. If the television **110** is mounted above a fireplace, upper link **176** and lower links **178** can rotate about respective axes of rotation **182**, **180** an angle in a range of about 90 degrees to about 160 degrees. Other angles are also possible, if needed or desired.
(50) FIGS. **12-15** show the linkage assembly **130** in a substantially upright position. The lower links **178** are alongside and laterally adjacent to the upper linkage **176**. FIG. **13** shows at least a portion of the lower link **178***a* positioned in front of the upper link **176** as viewed along the lower axis of rotation **182**. As shown in FIGS. **14** and **15**, upper link **176** is positioned between the lower links **178***a*, **178***b*. Such a nested arrangement provides a relatively low profile to position the mounted object very close to a wall.
(51) FIGS. **13**, **16**, and **17** show the linkage assembly **130** in an over-center configuration. The CG of the television **110** and the axis of rotation **183** are on opposite sides of an imaginary plane **340**. The lower inner axis of rotation **182** and tilt axis of rotation **250** lie in the imaginary plane **340**.

Gravitational force acting on the television **110** causes the pivots **230** to be pushed towards the wall **120** to keep the linkage assembly **130** in the stowed configuration. A locking mechanism **245**, illustrated as a locking knob mechanism, can be tightened to ensure that the linkage assembly **130** remains locked. The locking mechanism **245** can comprise a handle with a threaded member. The handle can be rotated to press the link **178** against a portion of the bracket **210** to prevent or inhibit relative movement between the link **178** and the bracket **210**. In other embodiments, the locking mechanism **245** can be in the form of a fine tune tilt adjustment mechanism and can include one or more gears, ratchet mechanisms, or other features that allow controlled tilting.

(52) When the linkage assembly **130** is in an unlocked state, the bottom of the television **110** can be pulled away from the support bracket **140** to move the pivots **230** away from the wall **120** and across the imaginary plane **340**. Once the pivots **230** move across the imaginary plane **340**, the linkage assembly **130** is released, thus allowing lowering of the television **110**.

(53) The lengths of the links **178** of FIG. **16** may be decreased to rotate the television **110** counterclockwise about the axis of rotation **250** so as to move the bottom of the television **110** rearwardly. The links **178** of FIG. **17** can be lengthened to tilt the top of the television **110** rearwardly. In various embodiments, television **110** can be tilted an angle α (FIG. **17**) of about ±5 degrees to about ±55 degrees. In certain embodiments, a tilt angle α of about 15 degrees can be achieved.

(54) FIGS. **18** and **19** show a mounting system **400** that is generally similar to the mounting system **100** discussed in connection with FIGS. **1-17**, except as detailed below. A positioner **410** includes a base **416** and a movable member in the form of an adjustment screw **418**. The adjustment screw **418** has external threads that engage internal threads along a passageway in the base **416**. A head **421** can limit travel of a pivot **412** along a slot **430**, illustrated in phantom line in FIGS. **20** and **20**A.

(55) Referring again to FIG. **19**, linkage assembly **420** is in a stowed configuration. Pivot **412** is forced towards a forward lower end **432** of the slot **430**. As a display bracket **440** is moved downwardly, pivot **412** can slide rearwardly and upwardly along the slot **430**. FIGS. **21** and **22** show the pivot **412** positioned at a rearward upper end **434** of the slot **430**. Referring to FIGS. **23** and **24**, pivot **412** is at the rearward upper end **434** of the slot **430**. The load applied by a mounted object pushes the pivot **412** towards the rearward upper end **434**.

(56) The illustrated head **421** can be moved by rotating the adjustment screw **418**. By moving the adjustment screw **418** into and out of the base **416**, tilt of the mounted object can be adjusted. For example, adjustment screw **418** can be moved outwardly away from the wall to tilt the display bracket **440** rearwardly. The link **438** has elongate members **441**, **443** that can be moved relative to one another to provide large amounts of adjustment. A locking mechanism **443** can be tightened using a wrench or other tool to lock the linkage **438**. In the illustrated embodiment, a pin **445** extends through a slot in the elongate member **443** and a hole in the elongate member **441**.

(57) The positioner **410** can function as a mode of operation selector to alternate the mounting system **400** between a four bar linkage system and a five bar linkage system. As shown in FIG. **20**A, when the adjustment screw **418** is in an extended position, pivot **412** is translationally fixed. The mounting system **400** thus functions as four bar linkage system. When the adjustment screw **418** is moved into the base **416** to allow translation of the pivot **412** along the slot **430**, the mounting system **400** functions as a five bar linkage system.

(58) FIGS. **25** and **26** show a display bracket **480** rotatable about an axis of rotation **482**, illustrated as a vertical axis of rotation, defined by a swivel mechanism **483**. The swivel mechanism **483** includes a pin **484** held by a retainer **486** and mounts **490**, **492**. The mounts **490**, **492** and/or retainer **486** can have slots, holes, or other types of features to allow different types of pivoting or swivel action. The display bracket **480** can be rotated to the left and right an angle β of about ±5 degrees to about ±55 degrees.

(59) Mounting systems can include any number of swivel mechanisms. For example, swivel

mechanisms can couple links to the support bracket and can couple the links to the display bracket. The number, positions, and orientations of the swivel mechanisms can be selected to achieve the desired functionality. FIG. **27** shows a wall mount **600** that includes a swivel mechanism **624** that connects a linkage assembly **628** to a support bracket **632**. The swivel mechanism **624** includes a pin **638** held by a mount **620**. A retainer **630** pivots with respect to the pin **638** to rotate about an axis of rotation **610**. The linkage assembly **628** can be rotated to the left and to the right an angle θ of about +5 degrees to about +30 degrees. Other angles are also possible, if needed or desired.

(60) FIG. **28** shows an automated mounting system **700** that can be moved using a controller **510** that communicates with a control device **720**. A motorized actuator **730** raises and lowers the television. The control device **720** can include a receiver that is communicatively coupled (e.g., wirelessly coupled, capacitively coupled, inductively coupled, or the like) to a transmitter of the controller **710**. A control device **720** can store information in memory and include one or more computing devices or processors. Memory can include, without limitation, volatile memory, non-volatile memory, read-only memory (ROM), random access memory (RAM), and the like. Stored information can include, but is not limited to, settings, weight of mounted object, or the like. Settings can include, but are not limited to, position settings (e.g., stowed positions, lowered positions, intermediate positions, or the like), times (e.g., times to automatically move the object), or the like.

(61) If the mounting system **700** is mounted above a mantel, the control device **720** can be programmed to ensure that the mounting system does not strike the mantel as a television is lowered downwardly past the top of the mantel. At a predetermined time (e.g., after normal bed time), the mounting system **700** can be automatically moved to the stowed configuration such that children cannot easily reach and pull on the television the next morning. In some embodiments, mounting system **700** can be automatically returned to the stowed configuration after the television has been turned OFF for a certain period of time.

(62) The control device **720** can be programmed to move the television **110** to different positions, each having a different indicator (e.g., number, code, etc.). The indicator can be entered using the controller **710**. Additionally or alternatively, control device **720** can include input devices, such as a touch pad, a touch screen, a keyboard, or the like. A user can use the input device to move the mounting system **700** into different positions without utilizing any remote. If the control device **720** is hidden behind a television, the user can reach behind the television to access the control device **720** and position the television as desired.

(63) Various methods and techniques described above provide a number of ways to carry out the invention. Of course, it is to be understood that not necessarily all objectives or advantages described may be achieved in accordance with any particular embodiment described herein and may depend on the use of the mounting systems. Thus, for example, those skilled in the art will recognize that the methods may be performed in a manner that achieves or optimizes one advantage or group of advantages as taught herein without necessarily achieving other objectives or advantages as may be taught or suggested herein. Furthermore, the skilled artisan will recognize the interchangeability of various features from different embodiments disclosed herein. Similarly, the various features and acts discussed above, as well as other known equivalents for each such feature or act, can be mixed and matched by one of ordinary skill in this art to perform methods in accordance with principles described herein.

(64) Although the invention has been disclosed in the context of certain embodiments and examples, it will be understood by those skilled in the art that the invention extends beyond the specifically disclosed embodiments to other alternative embodiments and/or uses and obvious modifications and equivalents thereof. Accordingly, it is not intended that the invention be limited, except as by the appended claims.

Claims

1. A system comprising: a mount assembly configured to carry an electronic display, the mount assembly including a display bracket including a rail and an elongate arm movable along the rail, wherein the elongate arm is configured to couple to the electronic display, a fixed support bracket configured to couple to a vertical wall, a linkage assembly rotatably coupled to the display bracket and the fixed support bracket, and a swivel mechanism coupled to the linkage assembly and the display bracket, wherein the swivel mechanism includes a pin defining a swivel axis of rotation, wherein the pin is positioned lower than an upper portion of the rail and lower than a portion of the elongate arm extending around the upper portion of the rail, wherein when the fixed support bracket is coupled to the vertical wall, the pin is positioned between opposing sides of the linkage assembly and an upper end of the pin is positioned lower than a portion of the linkage assembly; a motorized actuator coupled to the mount assembly and operable to move the display bracket to a raised position and a lowered position, wherein when the display bracket is at the lowered position, the elongate arm extends downwardly past the pin and the fixed support bracket; and a controller configured to communicate with a remote, wherein the controller is programmed to allow a user using the remote to move the display bracket.
2. The system of claim 1, wherein the elongate arm is a first elongate arm, the system further comprising a second elongate arm movable along the rail, wherein the first and second elongate arms are configured to hold the electronic display while being laterally spaced apart from the swivel mechanism.
3. The system of claim 1, wherein the elongate arm is configured to slide along the rail toward or away from the swivel mechanism.
4. The system of claim 1, wherein at least a portion of the pin is lower than the fixed support bracket when the display bracket is at the lowered position.
5. The system of claim 1, wherein the upper end of the pin is positioned lower than a pivot rotatably coupling the motorized actuator to the linkage assembly when the mount assembly is coupled to the vertical wall.
6. The system of claim 1, wherein the upper end of the pin is positioned lower than a portion of elongate arm hanging on the rail.
7. A system comprising: a mount assembly configured to carry an electronic display, the mount assembly including a display bracket, a fixed support bracket, a linkage assembly rotatably coupled to the display bracket and the fixed support bracket, and a swivel mechanism coupled to the linkage assembly and the display bracket, wherein the swivel mechanism includes a pin defining a swivel axis of rotation, wherein an upper end of the pin is positioned lower than a portion of the linkage assembly when the linkage assembly is in a raised configuration and a lowered configuration; a motorized actuator coupled to the mount assembly and operable to move the display bracket to a raised position above an object and a lowered position such that at least a portion of the display bracket is below the object when the mount assembly is coupled to a vertical wall; and a controller programmed to control the motorized actuator to move the display bracket.
8. The system of claim 7, wherein when the display bracket is at the lowered position, the display bracket includes a pair of elongated arms extending downwardly past the pin and the linkage assembly to hold at least a portion of the electronic display lower than the fixed support bracket, and at least a portion of the pin is positioned lower than the fixed support bracket.
9. The system of claim 7, wherein at least a portion of the pin is lower than the fixed support bracket when the display bracket is at the lowered position.
10. The system of claim 7, wherein the upper end of the pin is positioned lower than a pivot rotatably coupling the motorized actuator to the linkage assembly when the mount assembly is coupled to the vertical wall.

11. The system of claim 7, wherein the display bracket includes a rail and at least one elongate arm movable along the rail, and wherein the pin is spaced apart from the rail, positioned lower than an upper portion of the rail, and positioned lower than a portion of the at least one elongate arm hanging on the rail.
12. A method comprising: positioning a support bracket of a mounting system on a wall such that the support bracket is positioned above a fireplace, wherein the mounting system includes a display bracket configured to carry an electronic display, a linkage assembly rotatably coupled to the support bracket and the display bracket, wherein the linkage assembly is movable between a raised configuration and a lowered configuration, a motorized actuator configured to operate to move the display bracket, and a swivel mechanism coupled to the linkage assembly and defining a swivel axis of rotation; coupling the support bracket to the wall such that the support bracket is spaced apart from a mantel to prevent contact between the linkage assembly and the mantel when the motorized actuator lowers at least a portion of the display bracket below a top of the mantel, and wherein the display bracket is rotatable about the swivel axis of rotation, which is spaced apart from the mantel, when the linkage assembly is in the lowered configuration.
13. The method of claim 12, wherein the mantel is positioned outside a range of travel of the mounting system.
14. The method of claim 12, wherein the display bracket is rotatable at least ±5 degrees about the swivel axis of rotation without striking the mantel when the linkage assembly is in the lowered configuration.
15. The method of claim 12, wherein the motorized actuator is positioned above a lower arm of the linkage assembly when the linkage assembly is in the lowered configuration.
16. The method of claim 12, wherein a distance between the electronic display and the wall is less than 8 inches when the linkage assembly is in the raised configuration.
17. A system comprising: a mount assembly configured to carry an electronic display, the mount assembly including a display bracket including a rail and an elongate arm movable along the rail, wherein the elongate arm is configured to couple to the electronic display, a fixed support bracket, a linkage assembly rotatably coupled to the display bracket and the fixed support bracket, and a mechanism coupled to the linkage assembly and the display bracket, wherein the mechanism includes a pin, wherein the pin is positioned lower than an upper portion of the rail and lower than a portion of the elongate arm extending around the upper portion of the rail, wherein when the fixed support bracket is coupled to a vertical wall, the pin is positioned between opposing sides of the linkage assembly; a motorized actuator coupled to the mount assembly and operable to move the display bracket to a raised position and a lowered position, wherein when the display bracket is at the lowered position, the elongate arm extends downwardly past the pin and the fixed support bracket; and a controller configured to communicate with a remote, wherein the controller is programmed to allow a user using the remote to cause movement of the display bracket.
18. The system of claim 17, wherein the pin has a longitudinal axis between a portion of the display bracket and the linkage assembly, and wherein the pin is held translationally fixed relative to the linkage assembly.
19. The system of claim 17, further comprising at least one viewing adjustment device configured to set a viewing orientation of the display bracket, wherein the at least one viewing adjustment device is movable between a locked state for maintaining the viewing orientation of the display bracket while the motorized actuator operates to move the display bracket between raised and lowered positions, and an unlocked state for adjusting the viewing orientation of the display bracket.
20. The system of claim 19, wherein the at least one viewing adjustment device includes a threaded member configured to extend through a respective opening of the mount assembly, wherein the threaded member is movable along the respective opening to adjust the viewing orientation of the display bracket.

21. The system of claim 19, wherein the at least one viewing adjustment device includes a member rotatable in a first direction to lock together components of the system and rotatable in a second direction opposite the first direction to unlock the components.
22. The system of claim 19, wherein the at least one viewing adjustment device includes plurality of viewing adjustment devices each independently movable between the locked state and the unlocked state.
23. The system of claim 19, wherein the elongate arm is a first elongate arm, wherein the display bracket includes the rail and the first elongate arm and a second elongate arm, wherein the rail is configured to keep the first and second elongate arms spaced apart from the linkage assembly when the first and second elongate arms are moved along the rail, and wherein the first and second elongate arms are configured to couple to a television.
24. The system of claim 19, wherein the at least one viewing adjustment device includes an elongate body extending through and movable along a slot of the system; and a handle coupled to the elongate body.