LIFTING AND BARRIER MECHANISM

Inventor: Michael Salter, Willowdale (CA)

Correspondence Address:
FITCH EVEN TABIN AND FLANNERY
120 SOUTH LA SALLE STREET, SUITE 1600
CHICAGO, IL 60603-3406

Appl. No.: 11/677,314
Filed: Feb. 21, 2007

Related U.S. Application Data
Provisional application No. 60/775,379, filed on Feb. 21, 2006.

Publication Classification
Int. Cl. A47B 57/06 (2006.01)

ABSTRACT

A movable support surface supported arms may be moved when a driving mechanism including a motor that drives the arms. Guides guide the arms such that the movable support surface moves between extended and retracted positions. A movable barrier is pivotally attached to a flexible rack using a clip assembly. A motor drives the flexible rack such that the movable barrier moves between open and closed positions. When disposed in a display case, the movable support moves between storage and display positions such that the movable barrier moves between a closed position to protect items in storage and an open position to display items on the movable support. The movable support surface and movable barrier are controlled by a control mechanism that may include limit switches to facilitate automatic control. The control mechanism may be responsive to various outside signals, and a plurality of display cases may be simultaneously controlled.

Diagram of the lifting and barrier mechanism.
FIG. 1
LIFTING AND BARRIER MECHANISM

TECHNICAL FIELD

[0001] This invention relates generally to mechanisms for lifting and lowering a load and for moving a movable barrier, and more particularly to the application of such mechanisms in display cases.

BACKGROUND

[0002] Often vendors display merchandise for sale within a glass covered display case, also known as a showcase, to entice purchasers and to keep the merchandise secure from potential theft. When an establishment is closed or when a display case is otherwise left unattended, however, a person may attempt to steal the contents of the display by smashing the glass and grabbing the displayed merchandise. To prevent such losses, it is desirable to have an easy to use mechanism for more securely storing the merchandise when not on display. For instance, it is desirable to secure the merchandise without having to remove the merchandise from the display on a daily basis to avoid the extra labor and wear on the items and their display props and to decrease inventory shrinkage. Additionally, it is desirable for the outer portions of the display case to be aesthetically pleasing so as to enhance the display of the merchandise or other items to be displayed.

[0003] Various security mechanisms for use within display cases are known in the art. For example, it is known to install a movable barrier to cover the display case when the items are not on display. Also, certain mechanisms are known for deploying a movable barrier within the display case for protecting merchandise while not on display. Such systems are often installed on the exterior of the display case, are not aesthetically pleasing, can restrict access to other storage areas of the case, and can require considerable physical effort to position. Additionally, all existing systems that have the shutter stored external to the display case require a slot in the display case where the barrier is introduced or stored. This slot makes the structure of the case more vulnerable to breaking using a pry bar.

[0004] Further, it is desirable to place the displayed merchandise as close to the glass as possible for easy viewing by others. Therefore, the merchandise in such display cases with internal movable barrier security devices must be moved or otherwise situated to avoid contact with the barriers. Certain mechanisms for lowering a display shelf within a display case are known. These mechanisms vary from motorized linear lifts to scissor jack lift assemblies. Often, however, these devices are difficult to install in existing display cases or are difficult to use and/or unreliable over long term use. Further, the existing systems tend to operate very slowly and require the manual insertion of the barrier, which prevents the systems from being of any use during a daytime smash and grab raid.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The above needs are at least partially met through provision of the lifting and barrier mechanisms described in the following detailed description, particularly when studied in conjunction with the drawings, wherein:

[0006] FIG. 1 comprises a perspective view of a lifting mechanism as configured in accordance with various embodiments of the invention;

[0007] FIG. 2 comprises a perspective view of the lifting mechanism of FIG. 1 with a portion of the mechanism removed;

[0008] FIG. 3 comprises a perspective view of the underside of the base plate of the lifting mechanism of FIG. 1;

[0009] FIG. 4 comprises a perspective view of the motor, gear, and rack assembly of the lifting mechanism of FIG. 1;

[0010] FIG. 5 comprises an elevation cross-sectional view of a display case having a lifting mechanism as configured in accordance with various embodiments of the invention installed therein;

[0011] FIG. 6 comprises an elevation view of a shutter drive mechanism as configured in accordance with various embodiments of the invention;

[0012] FIG. 7 comprises a perspective view of the attachment of the flexible rack of FIG. 6 to a shutter slat via the clip assembly of FIG. 8 as configured in accordance with various embodiments of the invention;

[0013] FIG. 8 comprises an exploded and a linked view of a clip assembly as configured in accordance with various embodiments of the invention;

[0014] FIG. 9 comprises a perspective view of the lower shutter slat depicted in FIG. 7;

[0015] FIG. 10 comprises an exploded and linked view of an alternative clip assembly as configured in accordance with various embodiments of the invention;

[0016] FIG. 11 comprises an elevation cross-sectional view of a display case having a lifting mechanism and shutter drive mechanism installed as configured in accordance with various embodiments of the invention;

[0017] FIG. 12 comprises a perspective view of a platform and drawer of a display case in accordance with various embodiments of the invention; and

[0018] FIG. 13 comprises a perspective view of a battery and control mechanism for the lifting mechanism and shutter drive mechanism as configured in accordance with various embodiments of the invention.

[0019] Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions and/or relative positioning of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of various embodiments of the present invention. Also, common but well-understood elements that are useful or necessary in a commercially feasible embodiment are often not depicted in order to facilitate a less obstructed view of these various embodiments of the present invention. It will further be appreciated that certain actions and/or steps may be described or depicted in a particular order of occurrence while those skilled in the art will understand that such specificity with respect to sequence is not actually required. It will also be understood that the terms and expressions used herein have the ordinary meaning as is accorded to such terms and expressions with respect to their corresponding respective areas of inquiry and study except where specific meanings have otherwise been set forth herein.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0020] Referring now to the drawings, and in particular to FIGS. 1 and 2, a lifting mechanism 100 includes a motor 102 for driving two racks 104 and 106. The racks 104 and 106 are typically made of steel for durability purposes. Alterna-
tives to the racks may be contemplated by one skilled in the art. The distal end of each rack is pivotally attached to a first end of a primary arm 108 or 110. The second end of each primary arm 108 or 110 is pivotally attached to a first end of a support or secondary arm 112 or 114. The rack 104 and primary arm 108 travel between a pair of guide plates 116 and 118. Similarly, the second rack 106 and primary arm 110 travel between two guide plates 120 and 122. The guide plates 116, 118, 120, and 122 are securedly attached to a base plate 124, preferably by spot welding, and each pair of guide plates extends substantially perpendicularly away from the base plate 124 such that each pair of guide plates are substantially parallel. Each pair of guide plates also defines within their structures cam slots 126 and 128.

[0021] The primary arms 108 and 110 each include a pivot shaft 130 and 132 between the first and second ends of the primary arms 108 and 110. The pivot shafts 130 and 132 are preferably run in a small needle roller bearing pressed into the primary arm 108 or 110. The cam slots 126 and 128 slideably receive the pivot shafts 130 and 132 such that when the motor 102 drives the racks 106 and 108 and the primary arms 108 and 110, the pivot shafts 130 and 132 move along the paths defined by the cam slots 126 and 128. In this way, the movement of the primary arm 108 is controlled by how the primary arm 108 is attached to the rack 104 and the path defined by the cam slot 126. The second ends of the secondary arms 112 and 114 are pivotally attached to a load 134, typically the under side of a movable support surface, preferably a shelf or platform. Therefore, when the motor 102 drives the primary arms 108 and 110 to the distal ends of the lifting mechanism 100, the cam slots 126 and 128, by sloping in a generally upwards direction toward the distal ends of the lifting mechanism 100, guide the primary arms 108 and 110 in an upwardly direction thereby lifting the load 134 along a path predetermined by the cam slots 126 and 128. Other embodiments of the primary arm guides may be contemplated such as structure secured to the base plate or the display case engaging the sides or tops and bottoms of the primary arms to guide their movement when driven by the motor.

[0022] FIG. 1 illustrates the positions of the arms at two different stages of lifting or extending. The secondary arm 112 and the primary arm 108 on the left side of FIG. 1 illustrate the position of the arms in a preferred embodiment when driven by the motor 102 and the rack 104 to the extended position. One skilled in the art will recognize that the speed of the motor, the shape of the cam slot 126, and relative positions of the pivoting connections of the primary 108 and secondary 112 arms will determine the rate of motion for the load and the arm movement of various embodiments. Similarly, the secondary arm 112 and the primary arm 108 on the right side of FIG. 1 illustrate the position of the arms when driven by the motor 102 and the rack 106 to the lowered or retracted position.

[0023] FIG. 3 further illustrates how the racks 104 and 106 travel along the base plate 124. The distal end of each rack 104 and 106, in addition to being pivotally attached to a primary arm 108 or 110, is securely attached to a flange 136 and 138. The flanges 136 and 138 extend through slots 140 and 142 defined by the base plate 124. Rollers 144 and 146 attach to the flanges 136 and 138 on the side of the base plate 124 opposite that of the racks 104 and 106. The rollers 144 and 146 secure the flanges 136 and 138 to the base plate 124. In this way, the slots 140 and 142 and flanges 136 and 138 guide the horizontal travel and restrict the vertical movement of the racks 104 and 106.

[0024] FIG. 4 further illustrates the motor and rack assembly 148. The motor 102 drives a worm (not shown) in worm housing 150. The worm in turn drives a worm gear (not shown) in worm gear housing 152. The worm gear then turns a spur gear 154 that engages the teeth of the racks 104 and 106 to drive the racks 104 and 106 linearly as described above. Although various motor and gear types are applicable, the motor and worm gear assembly is preferably a readily available and inexpensive electric motor and gearbox unit as used in many automotive applications and may be securedly attached to the base plate 124 using screws, rivets, or other suitable fasteners. Apertures 156, 158, 160, and 162 in the racks 104 and 106 are used to connect the racks 104 and 106 to the flanges 136 and 138 and primary arms 108 and 110 as described above.

[0025] In the preferred embodiment illustrated in FIG. 5, the lifting mechanism 100 is installed in a display case 170 on a support structure of the display case 170, preferably a platform 171, using screws or other suitable fasteners to secure the base plate 124 to the platform 171. The load 134 in the preferred embodiment is a movable shelf 172 at its lowest position. The ends of the movable shelf 172 travel along the inner walls 174 and 176 of the display case 170. Guide rails 178 and 180 are fixedly attached to the inner walls 174 and 176, and the movable shelf 172 slidesly engages the guide rails 178 and 180 to generally stabilize the movable shelf 172 and constrain it to move substantially vertically during lifting and lowering.

[0026] So configured, the lift speed of the lifting mechanism is constant throughout the entire lifting distance, and thus the torque required of the motor 102 is constant throughout the entire lifting distance. Further, as shown in FIG. 5, the lifting mechanism’s 100 vertical profile in the lowered position is significantly smaller than the height it reaches at its fully extended position. This arrangement allows for the secure display of taller items within the display case 170. Additionally, the stable vertical movement of the movable shelf 172 limits the possibility of items falling from the platform and/or becoming entangled within the mechanism. Also, the movable shelf 172 may be stopped at any point throughout its movement without the need for a brake. Further, one may recognize that the mechanism may be configured such that the movable support surface or shelf 172 may be moved in a horizontal direction as well, where items are supported on the movable support surface for display through a vertical display surface.

[0027] Referring back to FIGS. 1 and 2, conventional limit switches 182 and 184 may be placed on the base plate 124 or otherwise located within the display case 170 and operably connected to the motor 102 to signal when the movable shelf 172 has reached a desired upper display or lower storage position. Preferably, the first limit switch 182 is secured to the base plate 124 using conventional means to contact one rack 104 and signal that the upper limit is reached when the rack 106 passes beyond the limit switch 182. Similarly, the second limit switch 184 is secured to the base plate 124 to contact the other rack 104 and signal that the lower limit is reached when the rack 104 makes contact with the limit switch 184. This lower limit switch 184 may also signal to the shutter drive mechanism to automatically begin driving the shutter to rise up and close off the display case 170 as described below.
Turning now to the shutter mechanism, FIG. 6 illustrates the drive mechanism 200 for a movable barrier. The shutter drive mechanism 200 includes a motor 204 for driving a worm (not shown) in a worm housing 206. The worm drives a worm gear (not shown) in a worm gear housing 208. The worm gear drives a pinion 210 through a spur gear 212. The motor and worm gear assembly is preferably readily available and inexpensive electric motor and gearbox unit as used in many automotive applications. The pinion 210 is preferably a plastic adaptor gear to facilitate engagement with a flexible rack 214 by the teeth of the flexible rack 214. The flexible rack 214 is made out of a plastic or other suitable durable and flexible material. The flexible rack 214 slidably engages and travels along a rack guide rail 216, which is preferably made from an aluminum extrusion process. The flexible rack 214 and rack guide rail 216 assembly is known in the art and readily available.

Conventional limit switches 215 and 217 may be placed on the rack guide rail 216 or otherwise located so as to detect the position of the flexible rack 214 and/or barrier. The limit switches 215 and 217 are operably connected to the motor 204 to signal when the barrier has reached a desired open or closed position. Preferably, the first limit switch 215 contacts the lower edge of the barrier 260 such that when the barrier is retracted, the limit switch 215 signals that the lower limit of the barrier was reached. The signaling of reaching the barrier’s lower limit may also automatically trigger the raising of the movable shell 172 as described above because the barrier is clear of the movable shell’s 172 path. Similarly, the second limit switch 217 contacts the flexible rack 214 such that when the barrier is raised, the limit switch 217 loses contact with the flexible rack 214 to signal that the upper limit of the barrier is reached.

One end of the flexible rack 214 attaches to the barrier through a clip assembly 220 illustrated in FIGS. 7, 8, and 9. The clip assembly 220 includes a lower shutter clip 222 and an upper shutter clip 224. The lower shutter clip 222 includes left 226 and right 228 flanges with apertures 230 and 232 in the flanges 226 and 228. The lower shutter clip 222 also includes upper 234 and lower 236 L-shaped flanges. The upper L-shaped flange 234 extends substantially along the plane defined by the lower shutter clip 222 before extending substantially perpendicularly from the plane. The portion of the upper L-shaped flange 234 extending substantially perpendicularly to the plane of the lower shutter clip 222 includes a tongue 238 bending in a plane substantially parallel to the plane of the lower shutter clip 222. The lower L-shaped flange 236 also extends substantially along the plane defined by the lower shutter clip 222 before extending substantially perpendicularly from the plane in a direction opposite that of the upper L-shaped flange 234. The lower L-shaped flange 236 portion in the plane of the lower shutter clip 222 also includes an aperture 240. A further aperture 242 passes through approximately the center of the lower shutter clip 222.

The upper shutter clip 224 includes left 244 and right 246 flanges with apertures 248 and 250 that substantially align with the left 226 and right 228 flanges and apertures 230 and 232 of the lower shutter clip 222. A third aperture 251 is included between the apertures 248 and 250 of the left 226 and right 228 flanges. The upper shutter clip 224 also includes an L-shaped flange 252 initially extending substantially perpendicularly from the plane defined by the upper shutter clip 224 before bending substantially parallel to the plane. The portion of the L-shaped flange 252 lying substantially parallel to the plane of the upper shutter clip 224 defines a slot 254 that engages the tongue 238 of the lower shutter clip 222.

With continuing reference to FIGS. 7, 8, and 9, the clip assembly 220 is assembled as follows. The lower L-shaped flange 236 of the lower shutter clip 222 engages the flexible rack 214, and a rivet 256 or other suitable fastener extends through the clip’s apertures 240 and 242 to secure the lower shutter clip 222 to the flexible rack 214. The lower shutter slat 258 of the movable barrier has first 260 and second 262 sides and an opening 264 for making accessible a bar 270 or lower edge of the slat 258 for engaging the clip assembly 220. The upper L-shaped flange 234 of the lower shutter clip 222 extends through the opening 264 via the second side 262 of the lower shutter slat 258. When the upper L-shaped flange 234 is disposed through the lower shutter slat opening 258, the slot 254 of the upper shutter clip 224 engages the tongue 238 of the lower shutter clip 222. The upper shutter clip 224 then abuts the lower shutter clip 222 such that the upper shutter clip apertures 248, 250, and 251 align with the lower shutter clip 222 apertures 230, 232, and 242, respectively. Screws or other suitable removable fasteners extend through the openings defined by the left apertures 248 and 230 and by the right apertures 250 and 232 to securely and removably fasten the upper shutter clip 224 to the lower shutter clip 222. The rivet 256 or other suitable fastener securing the lower shutter clip 222 to the flexible rack 214 extends through the upper shutter clip’s aperture 251 to allow secure and flush contact between the upper 224 and lower 222 shutter clips.

So configured, the upper L-shaped flange 252 of the upper shutter clip 224 and the upper L-shaped flange 234 of the lower shutter clip 222 form a pass through portion 268 that encloses the bar 270 of the lower shutter slat 258 at its opening 264 to allow rotation of the shutter slat 258 during movement. Additionally, the clip assembly 220 has a thin profile for traveling in a limited and narrow space within a display case 170. This clip assembly 220 provides the further benefit of being detachable from the shutter slat 258 for installation and servicing.

An alternative clip mechanism 400 is illustrated in FIG. 10. The alternative clip mechanism 400 includes a lower lip 410 of the lower shutter slat 258 that defines an aperture 412 along the length of the lower lip 410. The alternative flexible rack 214 includes a boss 418 or rounded ending that defines an aperture 420. The boss 418 may be integral with the flexible rack 214 or a separate structure otherwise affixed to the flexible rack 214. The lower shutter slat 258 also defines a slot 414, preferably sized to fit the width of the boss 418, and a locking slot 416 or aperture in the lower lip 410. The alternative clip mechanism 400 also includes a pin 422 that slidably engages the aperture 412 defined by the slot lower lip 410 and the aperture 420 in the boss 418 and flexible rack 214 relative to the lower shutter slat 258. The pin 422 includes a flange or tab 424 that engages the locking slot 416 to secure the location of the pin 422 in the lower lip aperture 412 and the boss aperture 420.

The alternative clip mechanism 400 has a thin profile for traveling in a limited and narrow space within a display case 170, is easily detachable for maintenance and installation of the shutter mechanism, and allows for the
flexible rack 214 to have a rotatable connection with the shutter that allows for rotation of the lower shutter slat 258 relative to the flexible rack 214 during operation.

[0036] When installed in a display case 170 as illustrated in FIG. 11, the rack guide rail 216 extends vertically along an inner wall 274 of the display case 170 and at least partially in a curved path into a lower portion 276 of the display case 170. The motor 204 and drive assembly 200 preferably have an integral design readily attached to the inner wall 274, platform 171, or other portion of the display case 170. In such a configuration, the flexible rail 214 has a defined path to follow vertically when the barrier or shutter 278 is driven to its closed position and a defined path to follow horizontally into storage in the lower portion 276 of the display case 170 when the barrier or shutter 278 is in its open position. The barrier or shutter 278 is preferably a sectional shutter assembly, often called a Tambour shutter, with guide wheels 280 that run along a shutter track 282, although other barrier structures may be used. The shutter track 282 defines the path in which the shutter 278 runs when driven by the drive assembly 200, and the shutter track 282 may be installed in profiled slots cut into the side walls 174 and 176 of the display case 170 and/or have a separate structure installed along the side walls 174 and 176. One skilled in the art will recognize that a variety of movable barriers may be operated with the drive mechanism 200 described herein.

[0037] FIG. 11 illustrates a preferred embodiment where the lifting mechanism 100 and shutter drive mechanism 200 are installed in a single display case 170. The lifting mechanism 100 is shown in the fully extended position where the movable shelf 172 is at an upper portion 284 of the display case 170 such that items placed on the movable shelf 172 are visible through an at least partially transparent partition, preferably the glass enclosure 286 of the upper portion 284, and the movable shelf 172 forms the floor of the display. The shutter 278 is fully retracted to allow the movable shelf 172 a clear path to the fully lifted position. When the user of the glass display case wishes to secure the items on the movable shelf 172, the lifting mechanism 100 lowers the movable shelf 172 into the middle portion 288 of the display case 170. Then, the shutter 278 is driven by the drive mechanism 200 along the shutter track 282 to enclose the items on the movable shelf 172 within the middle portion 288 of the display case 170. Preferably, the middle portion 288 of the display case 170 is lined with steel panels (not shown) to further guard against break-in. Further, a steel back panel 289 is fit to enclose the back side of the middle portion 288 around the control mechanism 300 such that when the sliding glass panels 290 of the display case 170 are closed and locked, the back panel 289 cannot be removed. So configured, the items are increasingly safe from a “smash-and-grab” attempt to steal the items because they are secured within the middle portion 288 of the display case 170 by the shutter 278 and steel panels.

[0038] An additional safety measure may be implemented through the provision of one or more magnet proximity switches 292, or other suitable switches, installed on the sliding glass panels 290 of the display case 170. The switches 292 are operably connected to the control mechanism 300 to disable the lifting mechanism 100 and drive mechanism 200 when the sliding glass panels 290 are open. Therefore, a person will not be injured by a moving movable shelf 172 or shutter 278, for example, by pinching a hand in the display case 170.

[0039] As configured, the shutter assembly is fully contained within the display case 170 thereby improving the aesthetic quality of the display case 170. Also, movement of the shutter 278 does not require any manual input.

[0040] Further, with reference to FIG. 12, the shutter assembly does not inhibit the use of at least one drawer 450 in the space 294 below the middle portion 288 of the display case 170. To provide additional security, a brace 452 securely affixed using conventional means to the movable shelf 172 extends downward toward the drawer 450. One or more hinges 454 are securely attached to the brace 452, preferably by being screwed to the brace 454. The hinges 454 include an engaging flange 456 that extends beyond the end of the brace 452. The engaging flange 456 engages a notch 458 in the side wall 460 of the drawer 450 when the movable shelf 172 is in the fully retracted position thereby locking the drawer 450. The engaging flange 456 is preferably biased toward the rear of the display case 170 such that if the movable shelf 172 is lowered when the drawer 450 is open or partially closed, the engaging flange 456 will merely fold upward against the side wall 460 of the drawer 450 and will extend down into the notch 458 when the drawer 450 is later fully closed.

[0041] Referring again to FIG. 11, one skilled in the art will appreciate that the width of the platform 171 supporting the lifting mechanism 100 may adjusted as needed. For example, the platform 171 may be as narrow as the base plate 124 to allow for passage of the brace 452. The narrow configuration of the platform 171 also allows for additional space for maintenance of the lifting mechanism 100 either from the back of the display case 170 or through the lower section 294, for instance, with the drawer 450 removed.

[0042] With continuing reference to FIG. 11, a control mechanism 300 for the motors 102 and 204 is also installed within the display case 170. The control mechanism 300 is operably connected to the motors 102 and 204, the limit switches 182, 184, 215, and 217 for the lifting mechanism 100 and the shutter drive mechanism 200, and the proximity switches 292 through conventional means to control the operation of the motors 102 and 204 as described herein. The control mechanism 300 is conventional and may be operated in a variety of ways and preferably includes a printed circuit board.

[0043] As further illustrated in FIG. 13, preferably, the control mechanism 300 is controlled by a user via a key switch 302 that when turned in a certain direction automatically drives the motors 102 and 204 to lower the movable shelf 172 and close the shutter 278. The limit switches 182, 184, 215, and/or 217 signal to the control mechanism 300 when to stop and start movement of the motors 102 and 204 in the given direction as described above. Similarly, turning the key switch 302 in the opposite direction will cause the motors 102 and 204 to drive the movable shelf 172 to the upper position and open the shutter 278 with the limit switches 182, 184, 215, and/or 217 signaling when to stop and start the motors 102 and 204. In a like way, the proximity switches 292 signal to the control mechanism 300 to not operate the motors 102 and 204 when the glass sliding panels 290 are open to prevent injury. One skilled in the art will recognize a variety of switch placements and/or imple-
mentations of logic circuitry to ensure safe turn-key operation of the lifting mechanism 100 in conjunction with the shutter drive mechanism 200. So configured, the display case 170 security mechanism provided by the lifting mechanism 100 and the shutter drive mechanism 200 may be operated by a person having no access to the contents of the display case 170. Further, the operation may be completed through the use of a single switch without further human intervention.

[0044] The control mechanism 300 may also include fuses or circuit breakers 304 and 306 for the motors 102 and 204 and the control circuit contained within the control mechanism 300. The fuses 304 and 306 are operably connected to the motors 102 and 204 and control circuit such that in the event of a mechanical jam, short circuit, or other occurrence preventing the normal operation of one the motors 102 and 204 or control circuit, a fuse 304 or 306 will blow thereby preventing damage to the motor 102 or 204 or control circuit. In such an event, the fuse 304 or 306 may be replaced and operation of the motor 102 or 204 reversed to clear the jam. Preferably, the first fuse 304 has a 2-4 amp breakdown value to protect the control circuit, and the second fuse 306 has a 10-15 amp breakdown value to protect the motor power circuits.

[0045] The control mechanism 300 also includes operator relays 308. The operator relays 308 typically connects to the various limit switches to provide control between the switches and the motors 102 and 204. Additionally, the control mechanism 300 typically includes a battery 310 for providing power to the lifting mechanism 100 and the shutter drive mechanism 200. In this arrangement, the battery 310 will be used to operate the lifting mechanism 100 and/or the shutter drive mechanism 200 when the outside power fails. The battery 310 is preferably a 12 VDC of a conventional rechargeable type thereby having enough power for several cycles of the lifting mechanism 100 and/or the shutter drive mechanism 200 before needing recharging. Preferably, the battery charger (not shown) is connected to the same power supply as the display case lights (not shown) so that the battery 310 is charged whenever the display lights are illuminated. Alternatively, the control mechanism 300 may be connected to an outside power supply (not shown) where the display case 170 is located.

[0046] In a further embodiment, the control mechanism 300 can be programmed or otherwise configured to automatically lower the movable shelf 172 and close the shutter 278 when receiving a signal that an alarm is tripped, the house power is lost, emergency has occurred, or to close all. Such embodiments are readily configured by one skilled in the art and provides increased security because it may operate without any need of human intervention. Further, the control mechanisms 300 of several display cases 120 may be linked to provide a single turn-key control of an entire room or store to provide additional ease of use and security. In such an embodiment, the control circuit for each case includes a quick connect junction that allows a harness to be installed to link the cases together. Alternatively, a separate single control mechanism 300 may control the operation of several display cases 170.

[0047] It is appreciated that securing items on display in a display case having the lifting mechanism and the shutter drive mechanism is made significantly easier by the turn-key operation of the mechanisms. An operator need not move, touch, or otherwise handle the items on display or the barrier to secure them. Instead, the operator need only turn the key switch to the closed position to lower the items and cover them with the shutter. Time is thereby saved and security increased by eliminating the need to handle the items to secure them. Further, the relatively simple design, using inexpensive and/or readily available components, renders the overall apparatus inexpensive to manufacture and simple to install.

[0048] Those skilled in the art will recognize that a wide variety of modifications, alterations, and combinations can be made with respect to the above described embodiments without departing from the spirit and scope of the invention, and that such modifications, alterations, and combinations are to be viewed as being within the ambit of the inventive concept.

We claim:

1. An apparatus comprising:
   a movable support surface;
   at least two support arms secured to the movable support surface;
   at least one primary arm connected to each support arm wherein each primary arm includes a first primary arm end and a second primary arm end wherein the second primary arm end of each primary arm connects to one of the at least two support arms;
   at least one primary arm guide operably engaging each primary arm such that the at least one primary arm guide guides the movement of the engaged primary arm;
   and a driving mechanism including a motor driving at least one driving member wherein each driving member is attached to the first primary arm end of one of the at least one primary arm.

2. The apparatus of claim 1 where the at least one primary arm guide further comprises at least one guide plate defining a cam slot that operably engages the primary arm such that the cam slot defines a movement path for a portion of the primary arm engaging the cam slot.

3. The apparatus of claim 1 wherein when the driving mechanism drives the at least one driving member, the driving member moves the primary arm as guided by the primary arm guide thereby moving the support arms that in turn move the movable support surface.

4. The apparatus of claim 1 wherein the motor further comprises an electric motor operably coupled to a control mechanism.