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Smieszek et al.(10) **Pub. No.: US 2006/0255697 A1**(43) **Pub. Date: Nov. 16, 2006**(54) **APPARATUS FOR MOVING A COVER OF FURNITURE****Publication Classification**(76) Inventors: **Włodzimirz Smieszek**, Krakow (PL);
Jozef Repelewicz, Krakow (PL); **Jozef Malek**, Krakow (PL); **Bogdan Grabania**, Brzesko (PL)(51) **Int. Cl.****A47B 81/00** (2006.01)**A47B 51/00** (2006.01)(52) **U.S. Cl.** **312/21; 312/312**

(57)

ABSTRACT

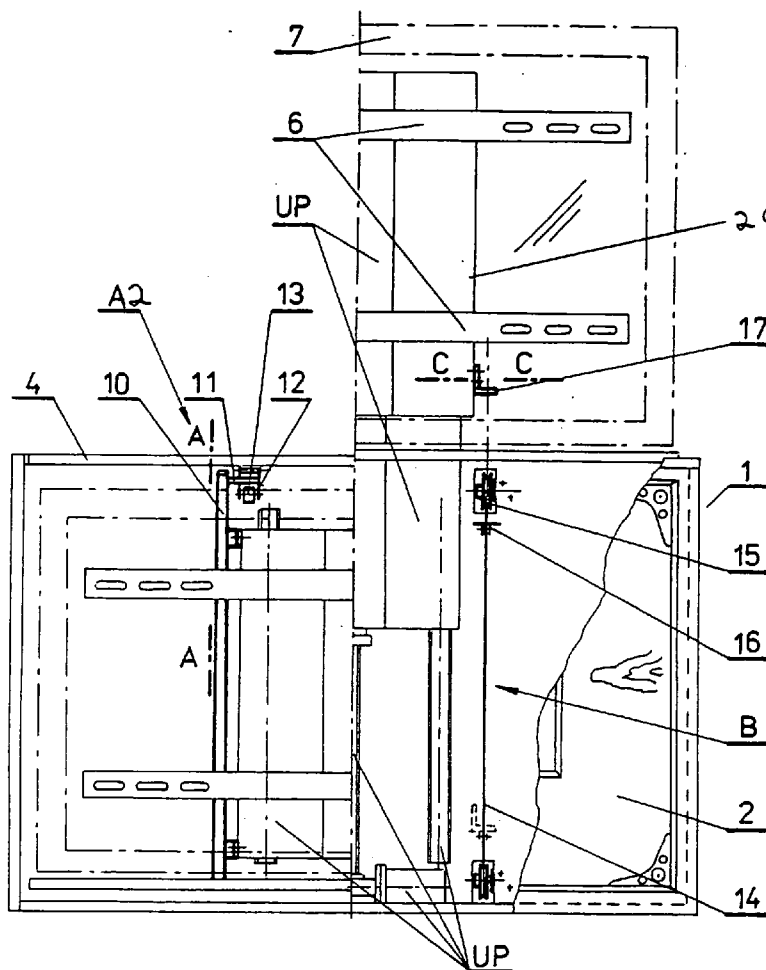
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The invention is an apparatus for moving a cover of an article of furniture in which a lift device is installed. The cover overlies an object to be raised by the lift device. The lift device includes a movable frame for raising and lowering the object. The apparatus includes a retracting mechanism, a cam mechanism, and a reverse motion mechanism. The retracting mechanism is coupled to a rear edge of the cover by a hinge means and includes at least one guide structured and arranged to guide the hinge means in a vertical plane. The cam mechanism includes at least one cam member fixed to the movable frame of the lift unit. The reverse motion mechanism includes a driver fixed to the movable frame of the lift device. The driver is operatively coupled to the retracting mechanism.

(21) Appl. No.: **11/373,728**(22) Filed: **Mar. 10, 2006**(30) **Foreign Application Priority Data**

Mar. 11, 2005 (PL) P373541



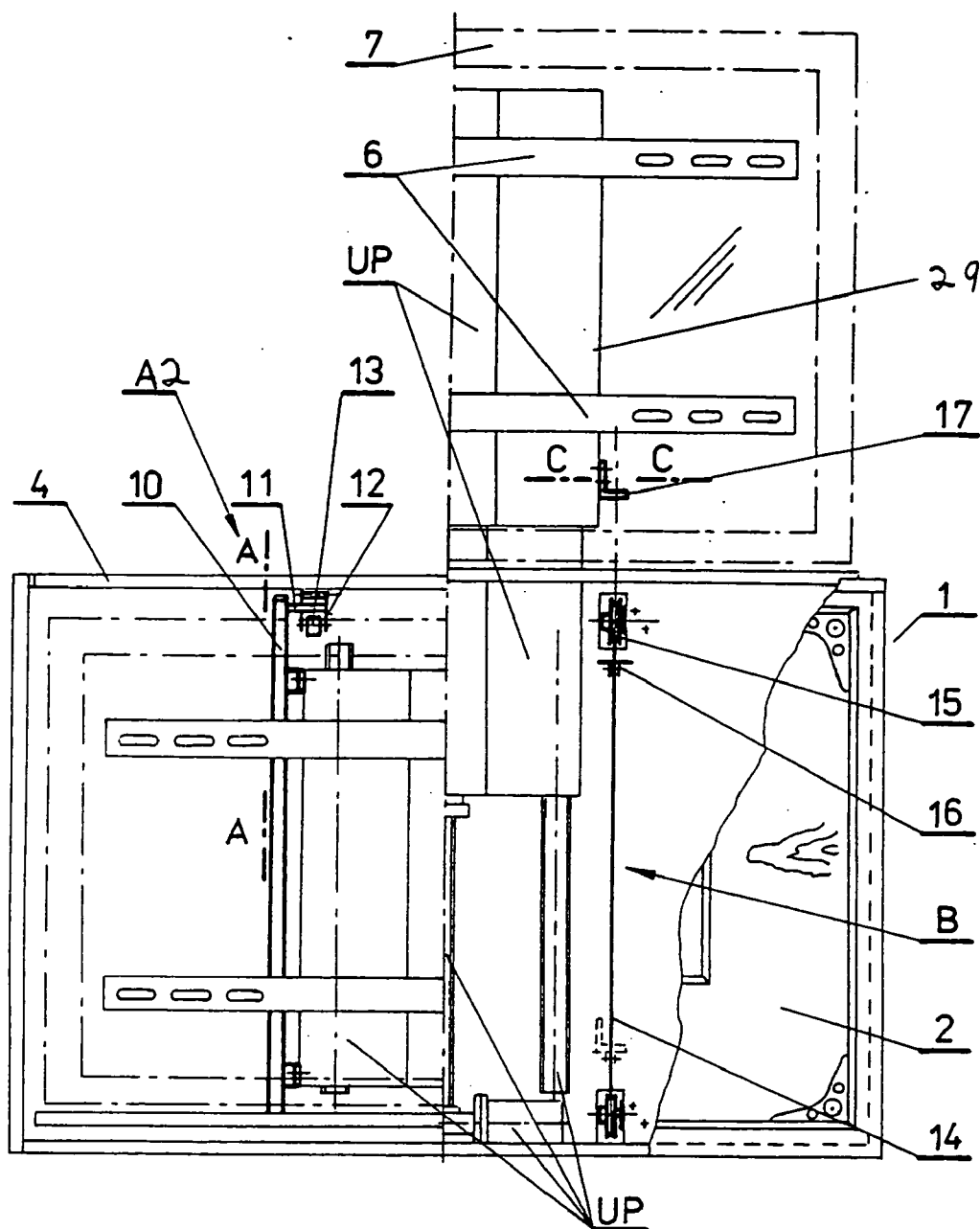


FIG.1

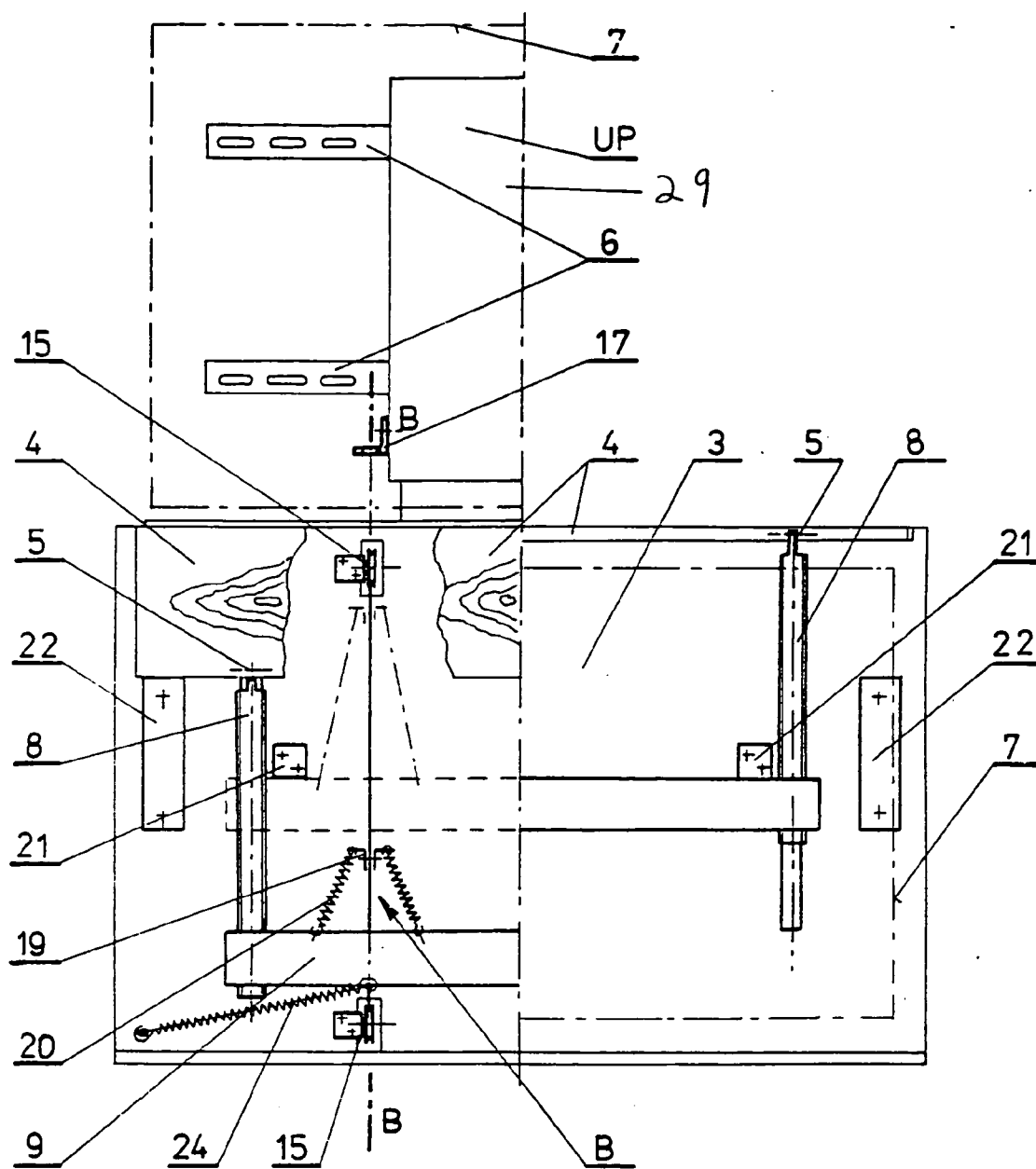


FIG.2

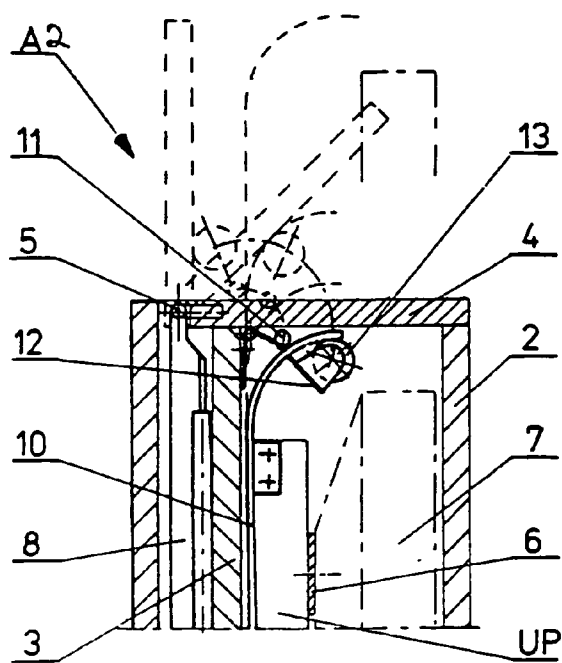


FIG. 3

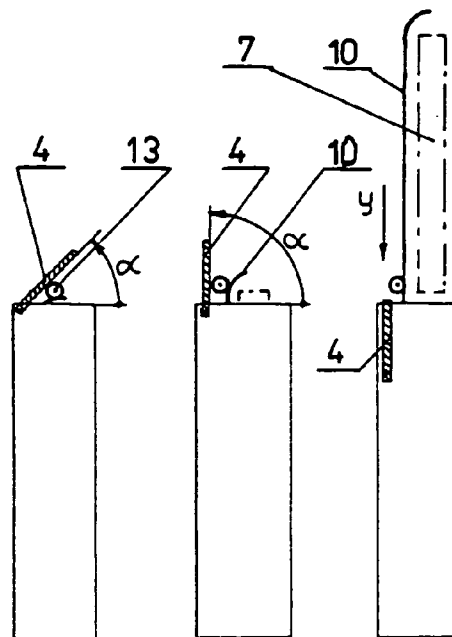


FIG. 4

FIG. 5

FIG. 6

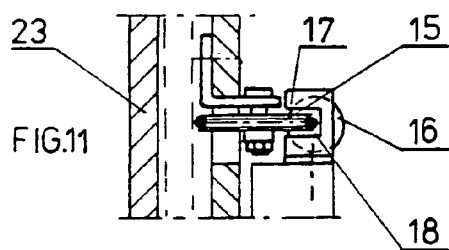


FIG. 11

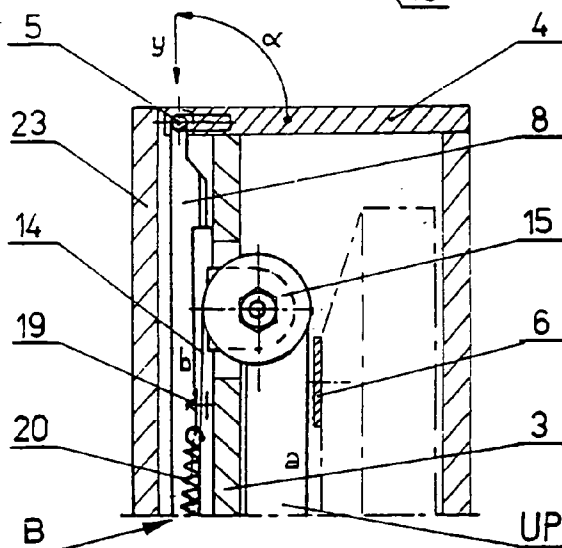


FIG. 7

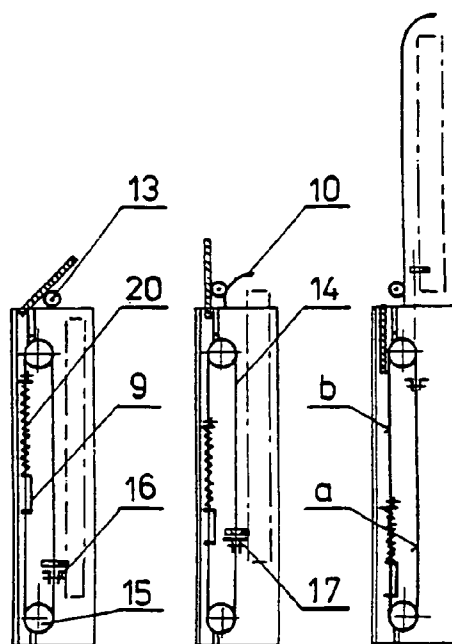
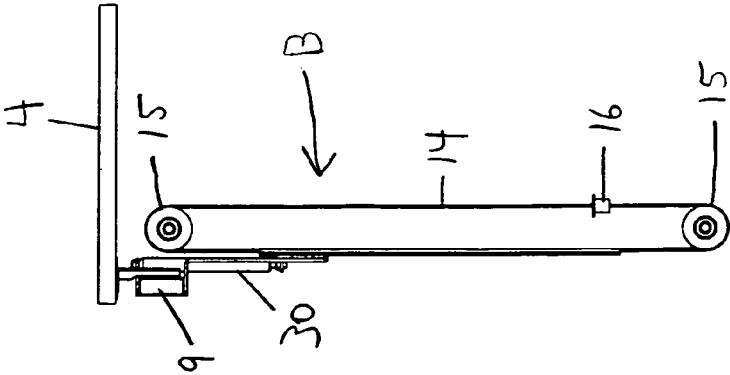
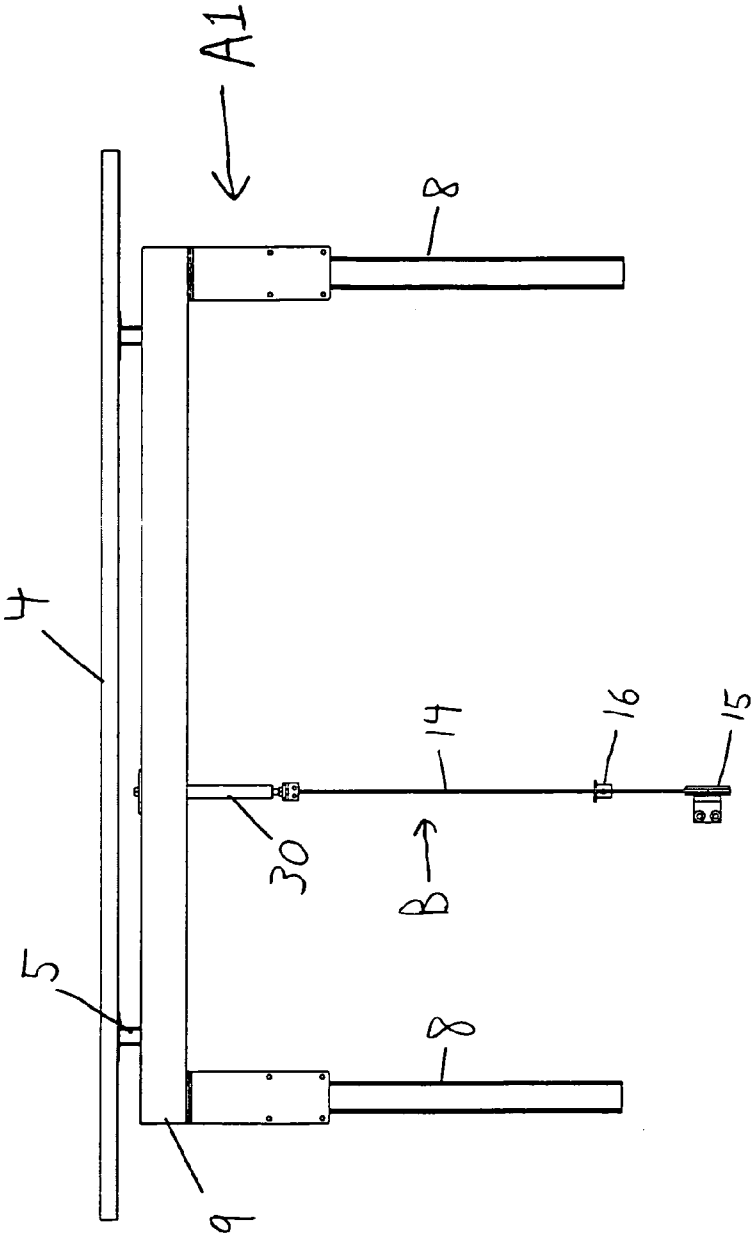


FIG. 8

FIG. 9

FIG. 10



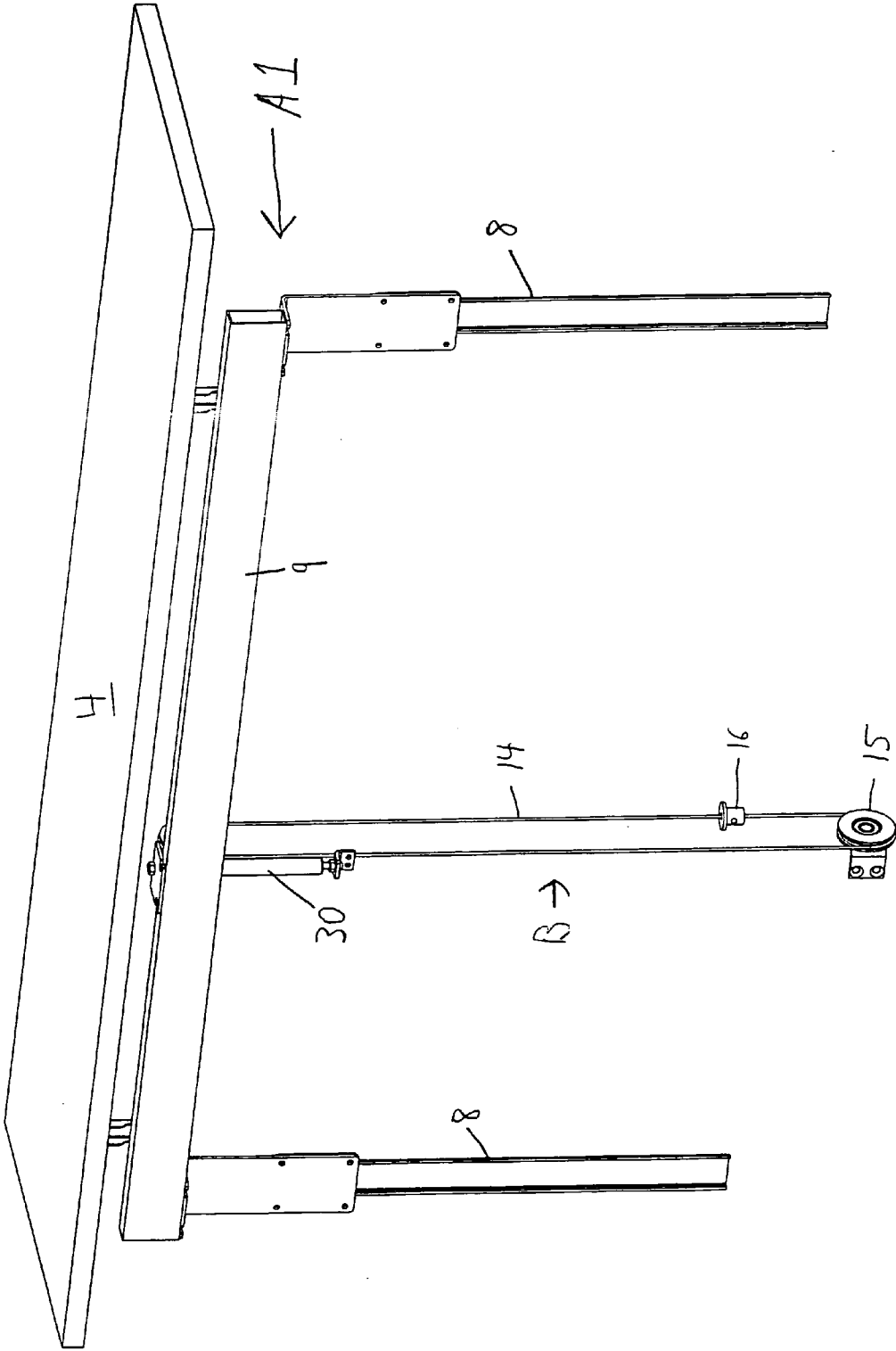
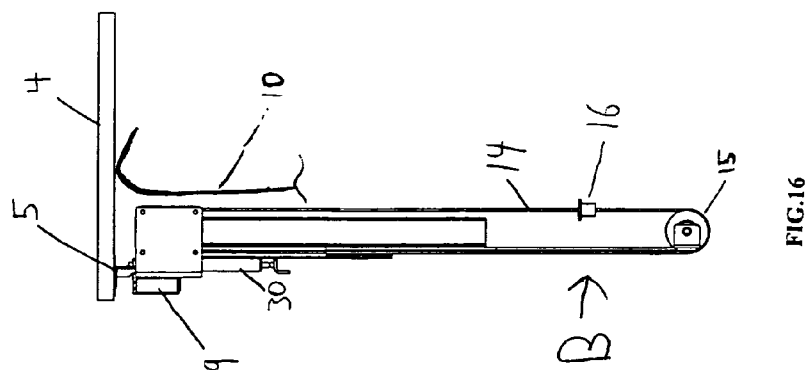
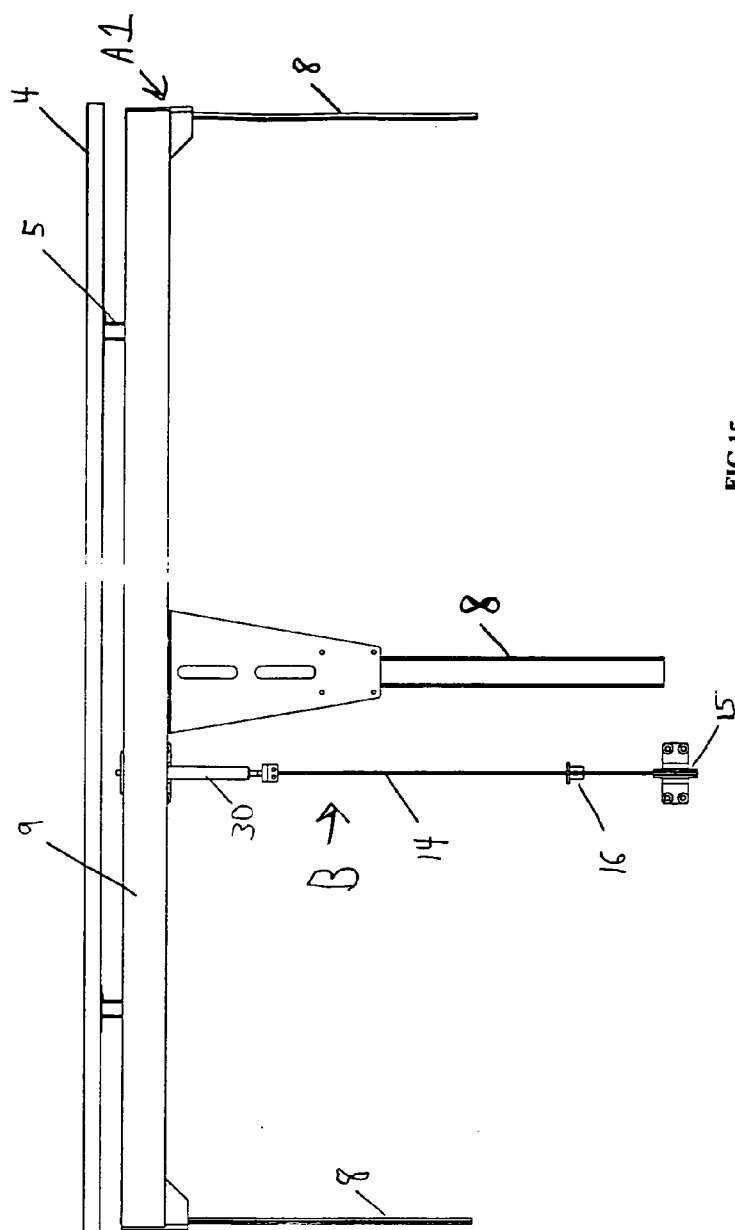
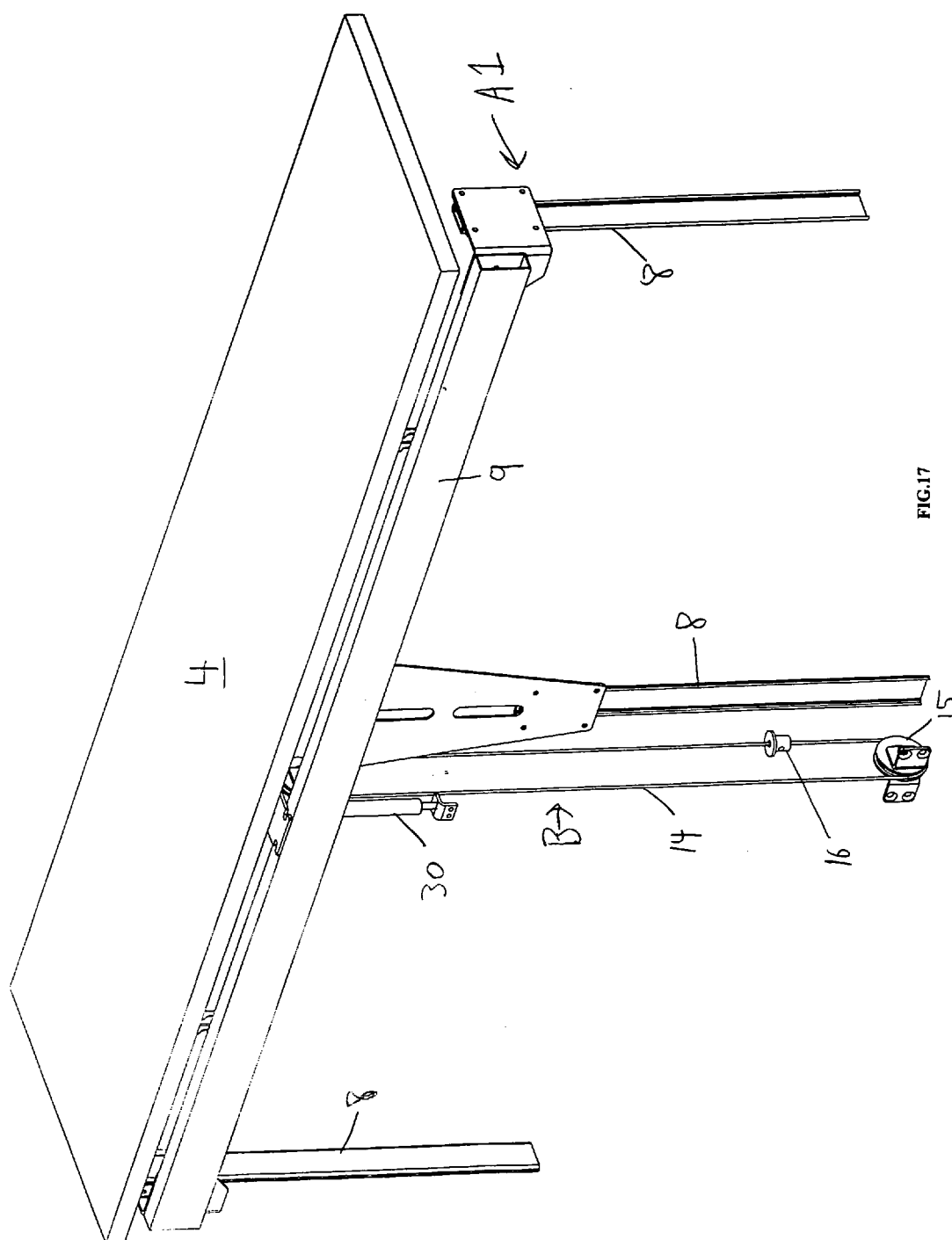


FIG. 14





APPARATUS FOR MOVING A COVER OF FURNITURE

FIELD OF THE INVENTION

[0001] The present invention relates generally to an article of furniture housing a lift device and, more particularly, to an apparatus for moving a cover of an article of furniture upon extension of a lift device housed within the article of furniture.

BACKGROUND OF THE INVENTION

[0002] The present invention was previously described in Polish Patent Application number P373541 filed Mar. 11, 2005 which is hereby incorporated by reference.

[0003] It has become common to house a flat screen display device, such as an LCD or plasma television, within an article of furniture such as a cabinet and to extend the device outside the cabinet via a lift mechanism when it is desired to view the display device and then retract it back into the cabinet when viewing is complete.

[0004] One of the difficulties in housing a flat screen display device in a cabinet on a lift device for selective elevation and retraction from and back into the cabinet is moving the cover or top panel of the article of furniture out of the way so that it does not interfere with the extending lift device and returning it to a closed position when the lift device is lowered.

[0005] Various solutions to this problem have been previously proposed. For example, known in the art is furniture for audio-video equipment and visual display units in which the cover of the furniture is fixed to the object to be lifted so that the cover is moved upward together with the object. Such concepts are presented, among others, in patent descriptions DE 19206996, DE 10050283, U.S. Pat. No. 4,735,467 and PL 188089. This solution is not adequate because, often times, the cover protrudes past the object forming an overhang. The overhang may obstruct visualization of the object, but in any case is aesthetically displeasing.

[0006] Furniture containers with the cover fixed on hinges along the back edge of the furniture tilted manually or by using a drive of a separate servomotor before the object is lifted are also known. **FIGS. 9 and 16** in application WO2004075684 show such a solution.

[0007] A moving mechanism of the cover of a furniture container which uses the drive of the lifting device installed in it is known from the description of the Polish invention application P-326614. The cover, fixed on hinges along the back wall of the container, is tilted by a cam unit driven by a vertical movement of the desktop on which the exposed object is fixed. The cam is fixed to the driven desktop horizontally and in a plane parallel to the axis of the hinges. It influences the roll of the arm which is rigidly fixed to the cover by a component of force.

[0008] The mechanisms previously known in the art are deficient because, as discussed above, they leave the cover in a visible position during exhibition of the object which in most cases ruins the aesthetics by forming a roof above the object or by leaving the cover sticking out over the back wall of the container. Furthermore, the solutions which tilt the cover by more than 90 degrees impose a necessity to

keep free space behind the article of furniture whose width must be at least the same as that of the cover.

SUMMARY OF THE INVENTION

[0009] It is therefore an object of the present invention to provide new and improved mechanisms for moving a cover of an article of furniture housing a lift device.

[0010] Another object of the present invention is to provide new and improved mechanisms for moving a cover of an article of furniture housing a lift device that retract the cover when it is opened such that it is housed within the article of furniture.

[0011] It is yet another object of the present invention to provide new and improved mechanisms for moving a cover of an article of furniture housing a lift device that are driven by the movement of the lift device.

[0012] It is a further object of the present invention to provide new and improved mechanisms for moving a cover of an article of furniture housing a lift device that open and close the cover in a smooth and gradual manner.

[0013] Briefly, in accordance with the present invention, these and other objects are attained by providing apparatus for moving a cover of an article of furniture that overlies an object to be raised by a lift device housed within the article of furniture including a retracting mechanism, a cam mechanism, and a reverse motion mechanism. The retracting mechanism is coupled to a rear edge of the cover by hinge means and includes at least one guide structured and arranged to guide the hinge means in a vertical plane. The cam mechanism includes at least one cam member fixed to a movable frame of the lift unit. The reverse motion mechanism includes a driver fixed to the movable frame of the lift device that is operatively coupled to the retracting mechanism.

[0014] In the initial phase of lifting of an object, the apparatus opens the cover by pivoting it until it is vertical. Thereafter, gravity, and in some embodiments springs, lower the now vertically disposed cover into the article of furniture. When the object is lowered back into the article of furniture, the movements are performed in a reverse order. The cover is raised in its vertical position, driven by the downward motion of the lift device. Thereafter, the cover is controllably pivoted back to its closed horizontal position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] A more complete appreciation of the present invention and many of the attendant advantages thereof will be readily understood by reference to the following detailed description when taken in conjunction with the accompanying drawings, in which:

[0016] **FIG. 1** is a front view, partially broken away, of a first embodiment of an apparatus for moving a cover of an article of furniture housing a lift device according to the present invention and showing the lift device in both its lower and upper positions;

[0017] **FIG. 2** is a rear view, partially broken away, of the first embodiment of an apparatus for moving a cover of an article of furniture housing a lift device according to the present invention and showing the lift device in both its lower and upper positions;

[0018] FIG. 3 is a sectional view taken along line A-A of FIG. 1;

[0019] FIG. 4 is a schematic side view of the first embodiment of an apparatus for moving a cover of an article of furniture housing a lift device according to the present invention at an early stage of retraction of the cover;

[0020] FIG. 5 is a schematic side view of the first embodiment of an apparatus for moving a cover of an article of furniture housing a lift device according to the present invention at an intermediate stage of retraction of the cover;

[0021] FIG. 6 is a schematic side view of the first embodiment of an apparatus for moving a cover of an article of furniture housing a lift device according to the present invention at a final stage of retraction of the cover;

[0022] FIG. 7 is a sectional view taken along line B-B of FIG. 2;

[0023] FIG. 8 is a schematic sectional view of the first embodiment of an apparatus for moving a cover of an article of furniture housing a lift device according to the present invention at an early stage of retraction of the cover;

[0024] FIG. 9 is a schematic sectional view of the first embodiment of an apparatus for moving a cover of an article of furniture housing a lift device according to the present invention at an intermediate stage of retraction of the cover;

[0025] FIG. 10 is a schematic sectional view of the first embodiment of an apparatus for moving a cover of an article of furniture housing a lift device according to the present invention at a final stage of retraction of the cover;

[0026] FIG. 11 is a sectional view taken along line C-C of FIG. 1;

[0027] FIG. 12 is a rear view of components of a second embodiment of an apparatus for moving a cover of an article of furniture housing a lift device according to the present invention;

[0028] FIG. 13 is a side view of the components of the second embodiment shown in FIG. 12;

[0029] FIG. 14 is a perspective view of the components of the second embodiment shown in FIG. 12;

[0030] FIG. 15 is a rear view of components of a third embodiment of an apparatus for moving the cover of an article of furniture housing a lift device according to the present invention;

[0031] FIG. 16 is a side view of the components of the third embodiment shown in FIG. 15; and

[0032] FIG. 17 is a perspective view of the components of the third embodiment shown in FIG. 15.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0033] Referring now to the drawings in which like reference characters designate identical or corresponding parts throughout the several views, and more particularly to FIGS. 1 and 2, an apparatus for moving the cover of an article of furniture housing a lift device in accordance with the invention is shown in conjunction with an article of furniture 1 is delimited by a front wall 2, a back wall 3, side walls and an upper pivotable cover 4. A lift device, designed

UP, with a screw-telescope drive to raise an object 7 is installed within the article of furniture 1. The support arms 6 are fixed to the movable frame 29 of the lift device UP. In this example, the object 7 is a large size TV plasma screen. The cover 4 is fixed along the back edge on hinges 5 to a retracting mechanism. The cover 4 is pivoted by a cam mechanism A driven by the vertical motion of the movable frame 29. The apparatus is driven by the vertical movement of the movable frame 29 of the lift unit UP which is preferably controlled by remote control.

[0034] The apparatus includes a retracting mechanism A1, a cam mechanism A2, and a reverse motion mechanism B. These mechanisms and their interrelations are described below.

[0035] The retracting mechanism A1 includes a pair of guides 8 which guide the hinge in a vertical plane. Each guide comprising an inner rectilinear member slidably disposed on ball bearings within an outer rectilinear member. In the illustrated first embodiment, upper ends of vertical guides 8 are located behind a back wall 3. The outer members of guides 8 are rigidly interconnected at their lower ends by a horizontal beam 9. The slidable member of the guides are hinged by hinges 5 to the back edge of the cover 4. In this way, the horizontal positions of axes of rotation of hinges 5 are situated in a vertical plane which is shifted parallel behind the back wall 3. It is understood that when multiple guides are used the cover need not be hinged to all of the guides.

[0036] In a second embodiment shown in FIGS. 12-14, the horizontal beam 9 interconnects the guides 8 at upper portions thereof. Furthermore, in this embodiment the cover 4 is hinged to the horizontal beam 9 by hinges 5. In a third embodiment shown in FIGS. 15-17, three vertical guides 8 are employed. Two of the guides 8 are positioned parallel to a respective side wall so that the guides face each other. The third guide is disposed parallel to the back wall 3. This configuration provides a more stable support for the cover. It is understood that the invention may be carried out with many alternate configurations of the guides. Additionally, any number of guides can be used in carrying out the invention, including only one. Furthermore, it is understood by those skilled in the art that, while preferable for improved stability, the horizontal beam is not required. Accordingly, the invention is not limited to the embodiments specifically described herein.

[0037] Referring now to FIGS. 3-6, the cam mechanism A2 has a cam member 10 formed from a flat bar fixed to the movable frame 29 of the lift device. The cam member 10 includes an upper portion having a curved surface extending away from the hinge and a lower rectilinear portion extending in a vertical direction. In the embodiment shown in FIGS. 3-6, a rocker arm 12 is pivoted by a bearing at the upper edge of the back wall 3 and is provided with a rocker follower 11 which follows the working surface of the cam member 10. A hard felt band may be adhered to the surface of the cam member 10. A roll 13 and rocker arm 12 engage the lower surface of the cover 4 to controllably pivot the cover as the lift is raised. The cam member 10 controls the position of the roll 13 in such a way that the cover 4 is in a closed, horizontal position when the rocker follower 11 first contacts the upper curved portion of the cam member 10 as the lift is raised. Upon the cover reaching a vertical position,

the rocker follower **11** is contiguous with the vertical part of the cam member **10**. In a horizontal closed position, the cover **4** should be supported on the front wall **2** or the side walls and leave a small slot between the rocker follower **11** and the cam member **10**. When the motor which drives the screw of the lift unit UP is switched on, the movable frame **29** with the cam member **10** is lifted. At the initial stage of movement the cam member **10** presses directly with its upper edge and lifts the cover **4**. Further opening of the cover **4** is accomplished by engagement of the roll **13** of the rocker arm **12** with the lower surface of the cover **4**. The roll **13** is moved by engagement of the cam follower **11** with the cam member **10**.

[0038] In another embodiment, shown in **FIG. 16**, the cam member **10** pivots the cover **4** directly, i.e. without the use of a rocker arm. The cam member **10** secured to the movable frame **29** of the lift device controllably engages and pivots the cover **4**. Although the cam member may be entirely rectilinear, it is preferable that the cam member be either curved at its upper portion with felt attached to its surface or employ a roll to prevent it from scratching the cover. The curved upper portion of the cam member **10** engages the cover **4** to controllably pivot the cover **4** between its vertical and horizontal position. The lower rectilinear portion of the cam member **10** contacts the cover in its vertical position to guide it as it is retracted and raised. It is understood that more than one cam member and rocker arm may be used to carry out the invention.

[0039] Referring now to **FIGS. 7-11**, the reverse motion mechanism B includes a pulley system having cable **14** running between a pair of pulleys **15**, fixed in slots within the back wall **3** and provided with bearings over them in a vertical plane, perpendicular to the back wall **3**. A plate clamp **16** is fixed on a first run (a) of the cable **14** situated toward the front of the rear wall **3**. The clamp **16** mates with a driver **17** fixed to the movable frame **29** of the lift device. The driver **17** has a slot **18** open on one side whose width is greater than the width of the pulley **15** and is situated in such a way that the axis of the slot **18** coincides with the plane of the pulley system or, more specifically, the first run (a) of the cable. The driver **17** engages the clamp **16** when the movable frame **29** of the lift device is lowered which in turn drives the pulley system which raises the retracting mechanism coupled to a second run (b) of the cable **14**. When the lift device is raised the cover **4** is placed on supports **22** and the driver **17** is moved further upwards, away from the plate clamp **16** by the lift unit UP, to the extreme position fully displaying the object **7**.

[0040] Apart from the basic screw-telescope unit, the lift unit UP can be provided with a rotation mechanism which allows the movable frame of the lift device to direct the screen in accordance with the requirements of the user. In a device improved in this way, it is necessary to align the vertical movement of the movable frame **29** of the lift device with placement of the slot **18** of the driver **17** such that it is coaxial with the central plane of the pulleys **15** of the cable **14**.

[0041] The driver **17** drives the reverse motion mechanism when the movable frame **29** is lowered and provides resistance to stop the cover from retracting too quickly as the movable frame rises. Accordingly, the reverse motion mechanism, in conjunction with the retracting mechanism,

returns the cover to its closed position based only on the drive of the lift device without the need for a separate motor. It is understood that the invention is not limited to the number of pulleys specifically described, nor to their specific arrangement.

[0042] The second run (b) of the cable **14** is coupled to the retracting mechanism. In one embodiment shown in **FIG. 2**, a catch **19** is connected with the guide beam **9** for guides **8** by two spiral tension springs **20** spaced symmetrically in relation to the cable **14**. The catch **19** is fixed on the second run (b) of the cable **14** which runs behind the back wall **3**. In another embodiment, a gas spring **30**, shown in **FIGS. 12-17**, is used to couple the second run of the cable to the retracting mechanism. It is understood that the tension springs **20** and the gas spring **30** may be fixed to either the horizontal beam **9** or the guide(s) **8**. It is also understood that any number of tension springs or gas springs may be used. Finally, the second run may be directly coupled to either the horizontal beam **9** or the guides **8**, however this arrangement may cause the cover **4** to jerk; it does not have as smooth movement and pivoting of the cover as the embodiments employing the springs.

[0043] Referring again to **FIG. 2**, a compensation spring **24**, which is stressed during movement of the beam **9** upwards, is fixed to the bottom of the beam **9**. The compensation spring **24** compensates friction resistance in guides **8** and causes adherence of the plate clamp **16** to the driver **17** at the stage when the cover **4** is tilted. The upper position of the beam **9** is limited by stops **21** fixed over it to the back wall **3**. The stops **21** are fixed in a position when the cover **4** is tilted so that the gravity shock produced during closing of the cover **4** is absorbed by additional stress of tension springs **20**. Supports **22** of the cover **4** located below the upper edge of back wall **3** a distance greater than or equal to the width of the cover **4** are fixed also to the back wall **3**. A back protection wall **23**, fixed behind the back wall **3** at a distance greater than thickness of the cover **4**, covers moving elements of the apparatus and is part of the article of furniture. The mechanism has also a gum strand which is not shown in the drawings. One end of the gum string is fixed to the front corner of the cover **4** and the other is fixed to the side wall of the container **1** in such position that the gum strand biases the cover in its vertical position and makes it press lightly on the cam mechanism. The gum strand causes the cover **4** to move silently without plays and, during the closing stage when the guides **8** are raised, it makes the cover **4** tilt forward on its hinges **5** so that it is pressed against the cam mechanism by gravity.

[0044] The arrangement of the reverse motion mechanism provides improved uniform movement of the cover **4**, especially when the stage of rotary movement α is being changed into vertical movement y and the other way round. The appropriate positioning of the plate clamp **16**, arrangement of the cam mechanism, and use of the springs all provide a more uniform and smooth movement. They also insure that the cover is opened and closed softly.

[0045] The description above indicates that a great degree of flexibility is offered in terms of the present invention. Although the present invention has been described in considerable detail with reference to certain preferred versions thereof, other versions are possible. Therefore, the invention is not limited to the preferred embodiments disclosed herein.

What is claimed is:

1. An apparatus for moving a cover of an article of furniture in which a lift device is installed, said cover overlying an object to be raised by said lift device, said lift device including a movable frame for raising and lowering the object, comprising:

a retracting mechanism coupled to a rear edge of said cover by hinge means, said retracting mechanism including at least one guide structured and arranged to guide said hinge means in a vertical plane;

a cam mechanism including at least one cam member fixed to said movable frame of said lift unit; and

a reverse motion mechanism including a driver fixed to said movable frame of said lift device, said driver operatively coupled to said retracting mechanism.

2. The apparatus according to claim 1, wherein said at least one cam member includes an upper portion having curved surface extending away from said hinge and a lower rectilinear portion extending in a vertical direction.

3. The apparatus according to claim 2, wherein said cam mechanism further comprises:

at least one pivotally mounted rocker arm, structured and arranged to be pivoted by engagement with a respective one of said cam members;

a rocker follower fixed to each respective rocker arm, each rocker follower following a respective one of said cam members; and

a roll fixed to each respective rocker arm which engages said cover to controllably pivot said cover between a closed horizontal position and a vertical position upon raising the object on said lift.

4. The apparatus according to claim 2, wherein said at least one cam member structured and arranged so that said upper curved portion of said at least one cam member controllably pivots said cover between its vertical and horizontal positions and said rectilinear portion of said at least one cam member guides said cover when said cover is in the vertical position.

5. The apparatus according to claim 4, wherein said at least one cam member has a felt surface.

6. The apparatus according to claim 1, wherein said reverse motion mechanism comprises:

at least two pulleys;

a cable disposed about said at least two pulleys having first and second runs;

a plate clamp secured to said first run of said cable;

a driver fixed to said movable frame of said lift device structured and arranged to engage said plate clamp upon lowering the object on said lift to move said cable; and

wherein said retracting mechanism is operatively coupled to said second run of said cable.

7. The apparatus according to claim 6, wherein said retracting mechanism is coupled to said second run by a gas spring.

8. The apparatus according to claim 6, wherein said retracting mechanism is coupled to said second run by at least one tension spring.

9. The apparatus according to claim 1, further comprising at least one support unit for the cover fixed below the upper edge of said article of furniture a distance greater than or equal to the width of said cover.

10. The apparatus according to the claim 1, wherein said at least one guide includes rectilinear ball bearings.

11. The apparatus according to the claim 1, wherein said lift device is spaced from the back of said article of furniture a distance slightly greater than the width of said cover.

12. The apparatus of claim 1, wherein said retracting mechanism includes at least two guides and further comprises a horizontal beam connecting said guides such that said beam is raised and lowered with said guides.

13. The apparatus according to claim 12, wherein the upper position of said beam is limited when said cover is in the closed position by a stopper which is fixed above said beam.

14. The apparatus according to claim 12, wherein said reverse motion mechanism is coupled to said beam via a gas spring.

15. The apparatus according to claim 12, wherein said beam is fixed to an upper portion of said guides.

16. The apparatus according to claim 15, wherein said rear edge of said cover is hinged to said beam.

17. The apparatus according to claim 16, having three guides, two of said guides are disposed on opposite sides of said article of furniture and are arranged so that the guides face each other; the third guide is substantially aligned with the center of said lift device.

18. The apparatus according to claim 1, wherein said rear edge of said cover is hinged to the upper vertical end of at least one of said guides.

* * * * *