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(54) SPA COVER-LIFTING APPARATUS AND METHOD

(57) A spa cover-lifting apparatus and method are described. The spa cover-lifting apparatus (20) (i.e., a "coverlifter") facilitates movement of a typical, existing, foldable spa cover (11) by remote control, from a spa-covering position over a spa (10) to a desired out-of-the-way non-covering position alongside the spa exterior. The coverlifter includes a crossbar (21) that is supported on a coverlifter-outfitted spa installation in a position extending over a hinge portion of the spa cover so that the crossbar is captured when the user manually folds a first half of the spa cover over a second half of the spa cover. Crossbar moving subassemblies support and move the captured crossbar by remote control in order to thereby move the spa cover over and then downwardly, from the spa covering position to the desired out of way non covering position.

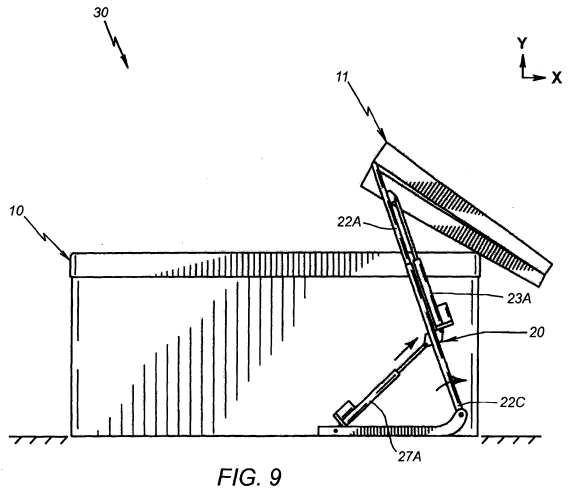

FIG. 9

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Description

[0001] This application claims the priority of U.S. Provisional Patent Application Serial No. 62/486,052 filed April 17, 2017 and U.S. Patent Application Serial No. 15/607,000 filed May 26, 2017, both of which are hereby incorporated in its entirety by this reference for all the information it provides.

[0002] The present invention relates generally to the field of spas, hot tubs, swim spas, spa pools, and the like. It relates more particularly to a cover-lifting apparatus for moving a spa cover from a spa-covering position, in which the spa cover is disposed over the spa, to a non-covering position in which it is moved from the spa-covering position in order to enable normal use of the spa, and to a coverlifter-outfitted spa and to a method of moving a spa cover.

[0003] The term "spa" herein includes a large tub structure or small pool (i.e., a water-holding vessel), that a user can fill with water (e.g., heated water) for hydrotherapy, relaxation, or pleasure. Such spas include hot tubs, swim spas, spa pools, and the like. When not in use, the spa is often covered with a known type of spa-covering structure (i.e., a "spa cover" or "hot tub cover"). The spa cover helps maintain spa water temperature and prevent spa water contamination. Due to their relatively large size, weight, and rigid construction, however, typical existing spa covers are often somewhat difficult to maneuver between a spa-covering position (i.e., a position in which the spa cover is disposed atop the spa) and a non-covering position (i.e., a position in which the spa cover has been moved from the spa-covering position in order to enable normal use of the spa).

[0004] Many details of spa cover construction are well known. A typical spa cover, for example, is about eighty-four inches wide by about eighty-four inches long (i.e., about 2.13 meters wide by 2.13 meters long). It has two halves, each of which includes a piece of polystyrene foam covered with vinyl cloth or other such material, and the two halves are joined together at a hinge portion of the spa cover. To move the spa cover from the spa-covering position in order to ready the spa for normal use, a user first folds the spa cover along the transversely extending hinge portion so that one of the two halves rests atop the other half. Then, the user moves the folded spa cover to the non-covering position. Doing so, however, can be somewhat difficult because the folded spa cover presents a relatively large size, weight, and rigid structure.

[0005] To facilitate movement of the spa cover, the spa is often provided with a cover-lifting apparatus. Some existing cover-lifting apparatuses move the hinge portion of the spa cover in order to thereby move the entire spa cover. For that purpose, a typical cover-lifting apparatus may include hinge-moving components connected to a crossbar that extends transversely across the spa cover alongside the hinge portion. A user manually operates the hinge-moving components to move the crossbar, and thereby the hinge portion and the entire spa cover. But, just the right combination of components remains elusive for providing the cover-lifting function effectively without leaving the moved spa cover as an elevated eyesore.

[0006] In view of the foregoing, what is needed is an improved spa cover-lifting apparatus and method that work effectively in an aesthetically pleasing manner.

[0007] According to a first aspect of the present invention, there is provided a cover lifting apparatus for moving a spa cover on a spa from a spa covering position of the spa cover, in which the spa cover is disposed over the spa, to a non covering position, in which it is moved from the spa covering position, in order to enable normal use of the spa, the cover lifting apparatus comprising:

a crossbar for placement over a hinge portion of the spa cover when the spa cover is on the spa in the spa covering position, so that the act of a user folding a first half of the spa cover over a second half of the spa cover results in a captured crossbar disposed in between the first and second halves;

an electrically powered crossbar moving assembly connected to the crossbar for moving the captured crossbar under user control in order to thereby move the spa cover from the spa covering position to the non covering position, said crossbar moving assembly including a first crossbar moving subassembly for attachment to a first side of the spa in a position forward of a back of the spa, and a second crossbar moving assembly for mounting on a second side of the spa in a position forward of the back of the spa, so that the first and second crossbar moving subassemblies do not extend behind the back of the spa in positions to interfere with movement of the spa cover to a position alongside the back of the spa; and

an electronic control module for operating the first and second crossbar moving subassemblies by remote control.

[0008] In an embodiment, the crossbar moving assembly includes at least a first electrically powered linear actuator on the first subassembly and at least a second electrically powered linear actuator on the second subassembly.

[0009] In an embodiment, the crossbar moving assembly includes at least a first pair of electrically powered linear actuators on the first crossbar moving subassembly, and at least a second pair of electrically powered linear actuators on the second crossbar moving subassembly.

[0010] In an embodiment, the first crossbar moving sub assembly includes a first crossbar moving strut and a first strut positioning member; and

the second crossbar moving subassembly includes a second crossbar moving strut and a second strut positioning member;

wherein the electronic control module operates said first and second crossbar moving struts and said first and

second strut positioning members under user control in order to thereby move the crossbar for cover moving purposes.

[0011] According to a second aspect of the present invention, there is provided a coverlifter outfitted spa, comprising:

a spa;
a spa cover on the spa; and
a cover lifting apparatus on the spa;
wherein the spa cover includes a first half, a second half, and a hinge portion intermediate and attached to the first and second halves;
wherein the cover lifting apparatus includes a crossbar that is not attached to the spa cover, said crossbar having a length sufficient to span the spa cover along the hinge portion of the spa cover, so that when the crossbar is in a position in which the crossbar extends over the hinge portion of the spa cover when the spa cover is in the spa covering position, the act of folding the first half of the spa cover over the second half of the spa cover results in the crossbar being captured between the first and second halves as a captured crossbar; and
wherein the cover lifting apparatus includes an electrically powered crossbar moving assembly for moving the captured crossbar under remote control of a user in order to thereby move the spa cover from the spa covering position to the non covering position.

[0012] In an embodiment, the crossbar moving assembly includes:

a first subassembly on a first side of the spa that is connected to a first end of the crossbar; and
a second subassembly on a second side of the spa that is connected to a second end of the crossbar; and
a combination of components for powering the first and second subassemblies electrically under remote control of the user.

[0013] In an embodiment, the crossbar moving assembly includes at least a first electrically powered linear actuator on the first subassembly and at least a second electrically powered linear actuator on the second subassembly.

[0014] In an embodiment, the crossbar moving assembly includes at least a first pair of electrically powered linear actuators on the first subassembly and at least a second pair of electrically powered linear actuators on the second subassembly.

[0015] In an embodiment, coverlifter outfitted spa further comprising an electronic control module for operating the first and second crossbar moving subassemblies by remote control.

[0016] According to a third aspect of the present invention, there is provided a method for moving a spa cover on a spa from a spa covering position to a non covering position, said spa having a front and a back, together with a first side and a second side that extend between the front and the back, the method comprising:

providing a cover lifting apparatus that includes a crossbar and a crossbar moving assembly that is electrically powered and remotely controlled, which cover lifting apparatus is mounted on the spa so that the crossbar extends transversely over a hinge portion of the spa cover when the spa cover is in the spa covering position;
folding a first half of the spa cover over a second half of the spa cover in order to thereby capture the crossbar in between the first and second halves of the spa cover as a captured crossbar; and
moving the captured crossbar by remote control operation of the crossbar moving assembly in order to thereby move the spa cover from the spa covering position to the non covering position.

[0017] In an embodiment, the step of providing a cover lifting apparatus includes providing a first crossbar moving subassembly that is mounted on the first side of the spa, and providing a second crossbar moving subassembly that is mounted on the second side of the spa, so that said first and second crossbar moving subassemblies are not mounted on the back of the spa, thereby to avoid interference by the crossbar moving subassemblies with movement of the spa cover downwardly to a lowered non covering position alongside the back of the spa.

[0018] In an embodiment, the step of providing a crossbar moving assembly includes providing an electrically powered crossbar moving assembly having multiple linear actuators.

[0019] In an embodiment, the step of moving the captured crossbar includes lowering the spa cover to an out of the way position along the back of the spa.

[0020] Preferred embodiments provide an electrically powered, readily retrofitted, cover-lifting apparatus (i.e., referred to herein simply as a "coverlifter") that a user operates by remote control. The coverlifter is readily retrofitted to an existing spa in that it includes an unattached crossbar that extends transversely alongside the hinge portion of an existing spa cover on the spa (without being attached to the spa cover) in a position to be captured when the spa cover is folded in preparation for removal. Crossbar-moving assemblies are included that move the crossbar under remote control by the user in order to not only move the spa cover from the spa-covering position, but also to then lower the spa cover to an out-of-the-way non-covering position alongside the spa exterior.

[0021] To paraphrase some of the more precise language appearing in the claims and further introduce the nomenclature used, a coverlifter constructed according to the present invention , in an aspect, includes a crossbar that is supported by first and second crossbar-supporting assemblies, each of which is attached to a re-

spective one of opposite first and second sides of the spa. With the spa cover in place in a spa-covering position on the spa, and the coverlifter installed on the spa in an operative position of the coverlifter (to thereby resulting in a coverlifter-outfitted spa), the crossbar extends transversely across the spa, and horizontally over the hinge portion of the spa cover; it extends that way from the first side of the spa to the opposite second side of the spa, so that manually folding a first half of the spa cover to a position over a second half of the spa cover results in the spa cover capturing the crossbar in the fold thereby produced. With the crossbar so captured, movement of the capture crossbar results in movement of the hinge portion, and thereby movement of the entire spa cover.

[0022] The first and second crossbar-moving assemblies may include crossbar-moving struts for supporting and moving the crossbar; they are extendible, by operation of electrically powered, linear actuators that vary the length of the crossbar-moving struts under remote control of the user. In addition, the first and second crossbar-moving assemblies preferably include strut-positioning members for adjusting the orientation of the crossbar-moving struts; they include additional electrically powered linear actuators that also operate by remote control of the user. The combined action provided by the crossbar-moving struts and the strut-positioning members enables the user to effectively move the crossbar and hinge portion, and thereby the entire spa cover, from the spa-covering position, and to then lower the spa cover to a desired out-of-the-way non-covering position alongside the spa exterior.

[0023] In line with the foregoing, in an aspect, the present invention provides a method for moving a spa cover on a spa, from the spa-covering position to an out-of-the-way non-covering position. The method includes the step of providing a cover-lifting apparatus on the spa as described above. The method proceeds by manually folding the spa cover along the hinge portion in order to thereby capture the crossbar. Then, the user operates the crossbar-moving assemblies by remote control in order to move the spa cover to the desired out-of-the-way, non-covering position of the spa cover alongside the spa exterior. Thus, the present invention provides an improved cover-lifting apparatus and method that work effectively in an aesthetically pleasing manner. The following illustrative drawings and detailed description make the foregoing and other objectives, features, and advantages of the invention more apparent.

[0024] Thus, preferred embodiments provide an electrically powered, readily retrofitted, spa cover-lifting apparatus (i.e., a "coverlifter") which facilitates movement of a typical, existing, foldable spa cover by remote control, from a spa covering position over a spa to a desired out of the way non covering position alongside the spa exterior. The coverlifter includes a crossbar that is supported on a coverlifter outfitted spa installation in a position extending over a hinge portion of the spa cover so that the crossbar is captured when the user manually folds a first half of the spa cover over a second half of the spa cover. Crossbar moving subassemblies support and move the captured crossbar by remote control in order to thereby move the spa cover over and then downwardly, from the spa covering position to the desired out of way non covering position. Preferably, linear actuators operate extendible crossbar-moving struts and strut positioning members in a synchronized manner via a programmable controller according to user operation of a handheld remote.

[0025] Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

FIG. **1** of the drawings is a diagrammatic elevation view of a first side of an existing spa constructed according to the prior art, showing an existing spa cover on the spa in a SPA-COVERING POSITION of the spa cover; an X-axis and a Y-axis of an XYZ Cartesian coordinate system are included for convenience in describing various spatial relationships;

FIG. **2** of the drawings is a diagrammatic top plan view of the existing spa and existing spa cover with the spa cover in the SPA-COVERING POSITION; an X-axis and a Z-axis of the XYZ Cartesian coordinate system are shown;

FIG. **3** of the drawings is a perspective view of a cover-lifting apparatus constructed according to the present invention that is shown by itself, before installation on the existing spa; the control components are illustrated diagrammatically;

FIG. **4** is a diagrammatic front elevation view of the existing spa and spa cover after the cover-lifting apparatus has been installed on the existing spa to result in a first "coverlifter-outfitted spa" having the crossbar component of the cover-lifting apparatus extending transversely over the hinge portion of the spa cover;

FIG. **5** is a diagrammatic top plan view of the first coverlifter-outfitted spa, identifying the front, the back, the first side, the second side, and the top of the spa cover;

FIG. **6** is a diagrammatic side elevation view of the first coverlifter-outfitted spa, showing the opposite second side;

FIG. **7** is a diagrammatic first side elevation view of the first side of the first coverlifter-outfitted spa, showing the spa cover in a SPA-COVERING POSITION of the spa cover;

FIG. **8** is another diagrammatic first side elevation view, showing the spa cover after it has been folded

to achieved a FOLDED POSITION of the spa cover, whereby the crossbar component of the cover-lifting apparatus is captured in the fold;

FIG. **9** is a diagrammatic first side elevation view, showing the spa cover after the hinge portion of the spa cover has been moved, by movement of the crossbar, to achieve a PARTIALLY MOVED POSITION of the spa cover;

FIG. **10** is a diagrammatic first side elevation view, showing the spa cover after the hinge portion has been moved further, by movement of the crossbar, to achieve a RAISED NON-COVERING POSITION of the spa cover;

FIG. **11** is a diagrammatic first side elevation view, showing the spa cover after the hinge portion has been moved downwardly from the RAISED NON-COVERING POSITION to achieve a LOWERED NON-COVERING POSITION of the spa cover;

FIG. **12** is a block diagram overview of the electronic control components of a cover-lifting apparatus constructed according to the present invention;

FIG. **13** is a flow chart of the steps involved in moving the spa cover according to the methodology of the present invention;

FIG. **14** is a diagrammatic perspective view of a second embodiment of a coverlifter-outfitted spa constructed according to another aspect of the present invention; it is a single-actuator embodiment identified as a second coverlifter-outfitted spa, for which each crossbar-moving subassembly includes just a single linear actuator; and

FIG. **15** is another diagrammatic perspective view of the second coverlifter-outfitted spa, showing the spa cover after it has been moved to a desired non-covering position.

FIGS. **1** and **2** of the drawings are diagrammatic representations that illustrate various background information about a typical existing spa **10** and spa cover **11** constructed according to the prior art, along with nomenclature to be used herein for describing the present invention. The illustrated existing spa **10** represents any one of various types and kinds of upwardly opening spa tub structures that functions as a rigid vessel for holding spa water, while supporting users in the spa water. It may be composed of any of various suitable materials (e.g., fiberglass on a molded acrylic shell) and include plumbing parts, water jets, control components, mood lighting, and even a spa stereo system and television unit (not illustrated). The existing spa cover **11** represents any one of various types and kinds of spa-covering structures that serves the function of covering the spa **10** during periods of non-use.

[0026] FIG. **1** is a diagrammatic side elevation view of a first side **10A** of the spa **10,** with the spa **10** shown in a typical operative position in which it is supported atop a horizontally extending support surface **12** (e.g., the ground). The first side **10A** extends horizontally (i.e., parallel to the X axis of the XYZ Cartesian coordinate system) from a first end of the spa **10** that is referred to herein as a front **10B** of the spa **10,** and an opposite second end of the spa **10** that is referred to herein as a back **10C** of the spa **10.** The first side **10A** extends vertically (i.e., parallel to the Y axis of the XYZ Cartesian coordinate system) from the support surface **12** to an upper rim **10D** of the spa **10** that supports the spa cover **11.** FIG. **1** also identifies a first half **11A** of the spa cover **11** that is attached to a second half **11B** of the spa cover **11** at a hinge portion **11C** of the spa cover **11.**

[0027] As more fully shown in FIG. **2,** the spa cover **11** has a width that extends horizontally, parallel to the XZ plane of the XYZ Cartesian coordinate system, from a first side of the spa cover **11,** that is referred to herein as a first spa cover side **11D,** to an opposite second side of the spa cover **11** that is referred to herein as a second spa cover side **11E.** In addition, the spa cover **11** has a length that extends horizontally from a first end of the spa cover **11** (i.e., a spa cover front **11F)** to an opposite second end of the spa cover **11** (i.e., a spa cover back **11E).** With the spa cover **11** on the spa **10** as illustrated, the first spa cover side **11D** is disposed above the first side **10A** of the spa **10,** the spa cover front **11F** is disposed above the front **10B** of the spa **10,** and the spa cover back **11E** is disposed above the back **10C** of the spa **10.** In addition, a hinge portion axis of elongation **11G** of the hinge portion **11C** extends horizontally, transversely over the spa **10.**

[0028] As a further idea of size, the illustrated spa **10** is a commercially available, rectangularly shaped, hot tub with dimensions of about 84 inches long (i.e., 2.13 meters long), measured from the front **10B** to the back **10C** parallel to the X axis, and about 84 inches wide (i.e., 2.13 meters wide) measured perpendicular to the XY plane. The various views presented in the drawings of the spa **10** are drawn to the same drawing scale so that other approximate dimensions of the spa **10,** the spa cover **11,** and the cover-lifting components subsequently described, can be determined by comparison to the dimensions given for the length and width. Of course, the present invention also applies to other shapes and sizes.

[0029] With the foregoing background information and nomenclature in mind, consider FIG. **3.** It shows a cover-lifting apparatus constructed according to the present invention in the form of a coverlifter **20,** along with a diagrammatic representation of its power and control components connected electrically to linear actuator components of the coverlifter **20** by cabling depicted in FIG. 3

by phantom lines. The coverlifter **20** includes a crossbar **21,** along with an electrically powered crossbar-moving assembly having a first crossbar-moving subassembly for mounting on the first side **10A** of the spa **10,** and a second crossbar-moving subassembly for mounting on an opposite second side of the spa **10.** The crossbar **21** extends between first and second crossbar ends **21A** and **21B** along a straight line axis of elongation **21C,** and an upper portion of each of the first and second crossbar-moving subassemblies is connected to a respective one of the crossbar ends **21A** and **21B** for purposes of moving the crossbar **21** under user control.

[0030] The crossbar **21** is a rigid component having a length more than the width of the spa **10,** taking the form, for example, of a metal tube having an outside diameter of 1.0 inches (2.54 centimeters). Each of the first and second crossbar ends **21A** and **21 B** is connected to a respective one of first and second telescoping strut sections **22A** and **22B** (e.g., metal tubes). Each of the strut sections **22A** and **22B** extends telescopingly into a respective one of larger-diameter, third and fourth telescoping strut sections **22C** and **22D** (e.g., metal tubes). For the illustrated coverlifter **20,** the crossbar **21** and the first and second telescoping strut sections **22A** and **22B** take the form of a single length of metal tube that has been bent into the illustrated shape; the crossbar **21** and the strut sections **22A** and **22B** are all a single piece of tubing.

[0031] The combination of the first telescoping strut section **22A** and the larger-diameter third telescoping strut section **22C,** along with a first linear actuator **23A,** form an extendible first crossbar-moving strut. Similarly, the combination of the second telescoping strut section **22B** and a larger-diameter fourth telescoping strut section **22D,** along with a second linear actuator **23B,** form an extendible second crossbar-moving strut. The first and second crossbar-moving struts so formed are extendible under user control by remote operation of the electrically powered first and second linear actuators **23A** and **23B.**

[0032] A lower end portion of the first crossbar-moving strut (i.e., the strut sections **22A** and **22C** in combination with the linear actuator **23A**) is connected pivotally to a first mounting **25A** (e.g., a rigid metal plate), for pivotal movement about a first horizontally extending pivotal axis **26** that is parallel to the axis of elongation **21C** of the crossbar **21.** Similarly, a lower end portion of the second crossbar-moving strut (i.e., the strut sections **22B** and **22D** in combination with the linear actuator **23B**) is connected pivotally to a second mounting **25B,** for pivotal movement about said first horizontally extending pivotal axis **26** (FIG. **3**). With the first and second mountings **25A** and **25B** attached to the spa **10,** as illustrated and discussed later on, changing the length of the first and second crossbar-moving struts by remote control operation of the first and second linear actuators **23A** and **23B** results in remotely controlled movement of the crossbar **21** (and thereby remotely controlled movement of the folded spa cover).

[0033] Preferably, the coverlifter **20** also includes electrically powered, remotely controlled, third and fourth linear actuators **27A** and **27B** that function under user control as first and second strut-positioning members. A lower end portion of the third linear actuator **27A** is connected pivotally to the first mounting **25A for** pivotal movement about a second horizontally extending pivotal axis **28** (FIG. **3**). Similarly, a lower end portion of the fourth linear actuator **27B** is connected pivotally to the second mounting **25B** for pivotal movement about said second pivotal axis **28.** Operation of the third linear actuator **27A** changes the position of the first crossbar-moving strut, while operation of the fourth linear actuator **27B** changes the position of the second crossbar-moving strut, all for purposes of moving the spa cover **11** as desired.

[0034] With further regard to nomenclature, the combination of the third linear actuator **27A,** the extendible first crossbar-moving strut, the first mounting **25A** and the associated electronics is referred to herein as a first crossbar-moving subassembly. The combination of the fourth linear actuator **27A,** the second crossbar-moving strut, the second mounting **25B,** and the associated electronics is referred to herein as a second crossbar-moving subassembly. The first and second crossbar-moving subassemblies so defined are generally similar, except that the first and second mountings **25A** and **25B** have mirror-image shapes that adapt each for mounting on a respective one of the first and second sides of the spa **10.** With the first and second mountings **25A** and **25B** attached to the spa **10,** remotely controlled operation of the third and fourth linear actuators **27A** and **27B** enables additional user control of the first and second crossbar-moving struts (and thereby additional remote control of spa cover position).

[0035] FIGS. **4** and **5** show the coverlifter **20** mounted on the existing spa **10.** The resulting combination is referred to herein as a first coverlifter-outfitted spa **30.** The coverlifter **20** is mounted on the existing spa **10** by attaching the mountings **25A** and **25B** to sidewalls or other spa structure on the first and second sides **10A** and **10E** of the spa **10,** using screws or other suitable fastener means. The first mounting **25A** is attached to the first side **10A** of the spa **10,** and the second mounting **25B** is attached to the opposite second side **10E** of the spa **10.** The coverlifter **20** is mounted that way so that the crossbar **21** is in a position to be captured by the spa cover **11** when the spa cover **11** is folded along the hinge portion **11C** of the spa cover **11.** For that purpose, the coverlifter **20** is mounted so that the axis of elongation **21C** of the crossbar **21** is parallel to and above the axis of elongation **11G** of the hinge portion **11C** that was first identified herein with reference to FIG. **2;** the axis of elongation **21C** is no further than about three inches (7.62 centimeters) above said axis of elongation **11G,** so that the act of folding the spa cover **11** readily captures the crossbar **21** in the fold.

[0036] As illustrated in FIGS. **5** and **6,** the coverlifter **20** is not mounted on the back **10C** of the spa **10,** nor

does it extend transversely behind the back **10C.** The coverlifter **20** is, instead, mounted on the first and second sides **10A** and **10E** in a position such that its structure will not block or otherwise interfere with movement of the spa cover **11** to the LOWERED NON-COVERING POSITION of the spa cover **11.** In terms of an imaginary reference plane **30A** that is parallel to the YZ plane of the Cartesian coordinate system (such that the imaginary reference plane **30A** contains at least a portion of the back **10C**), the mountings **25A** and **25B** of the coverlifter **20** are mounted on the spa **10** ahead of the imaginary reference plane **30A,** toward the front **10B** of the spa **10.** Thus, the first horizontally extending pivotal axis **26** is also ahead of the reference plane **30A.** The side elevation view shown in FIG. **6** of the opposite second side **10E** of the spa **10** further illustrates that aspect.

[0037] Turning now to FIG. **7** through FIG. **11,** they show various positions of the spa cover **11** as a user (not shown) folds it manually and then moves it by remote control of the electrically powered coverlifter **20** (i.e., remote control of the electrically powered crossbar-moving assembly). Remote control operation of the crossbar-moving assembly involves synchronized movement of the first and second crossbar-moving subassemblies mounted on opposite sides of the spa **20.** Movement of the first and second cover-moving subassemblies is synchronized so that they maintain the crossbar **21** perpendicular to the XY plane as they move the crossbar **21.** Preferably, the electronic control components accomplish the required synchronization of the first and second crossbar-moving subassemblies. In describing movement of the spa cover **11** at this point, however, remote control of just the first crossbar-moving subassembly is described.

[0038] First, consider FIG. **7.** It shows the spa cover **11** in the SPA-COVERING POSITION, a position in which the spa cover **11** is disposed over the spa **10.** To move the spa cover **11** from that position, the user first folds the spa cover **11** manually to the FOLDED POSITION shown in FIG. **8.** That is done in order to capture the crossbar **21** in the resulting fold. The user folds the spa cover **11** manually, by folding the first half **11A** of the spa cover **11** over the second half **11 B** so that the crossbar **21** is held between the two halves.

[0039] Next, the user remotely controls the third linear actuator **27A** (i.e., the first strut-positioning member) in order to extend its length and thereby move the position of the first crossbar-moving strut (i.e., the strut sections **22A** and **22C** in combination with the first linear actuator **23A**). That movement is indicated by the bold arrowheads in FIG. **9.** Doing so moves the crossbar **21** and the spa cover **11** to the PARTIALLY MOVED POSITION shown in FIG. **9.**

[0040] Then, the user continues to remotely control the third linear actuator **27A** in order to further extend the length of the first strut-positioning member, and thereby move the position of the first crossbar-moving strut, as indicated by the bold arrowheads in FIG. **10.** The user does so until the crossbar **21** and the spa cover **11** are moved to the RAISED NON-COVERING POSITION shown in FIG. **10.**

[0041] After the foregoing steps, the user remotely controls the first linear actuator **23A** in order to decrease the length of the first crossbar-moving strut, as indicated by the bold arrowheads in FIG. **11.** The user does so until the crossbar **21** and the spa cover **11** are moved downwardly to the LOWERED NON-COVERING POSITION shown in FIG. **11;** that is an out-of-the-way position of the spa cover **11** behind the back **10C** of the spa **10** in which the spa cover **11** extends higher than the upper rim **10D** of the spa **10** by an amount less than one-fourth of the full unfolded length of the spa cover **11.** It is an out-of-the-way position in the sense that the spa cover **11** is less noticeable to nearby observers than it is when the spa cover **11** is higher (e.g., when the spa cover **11** is in the RAISED NON-COVERING POSITION). The user reverses the order of the foregoing steps when the user desires to move the spa cover **11** back to the SPA-COVERING POSITION shown in FIG. **7.**

[0042] FIG. **12** is a block diagram of the electronic control components of the present invention. An electronic control module **41** functions as a controller that works together with handheld remote **42** over a wireless or other communications link (that is depicted by the communications link symbol **43** in FIG. **12**) to enable remote control of the linear actuator components of the crossbar-moving assemblies. The electronic control module **41** (e.g., a 120-volt AC to 12-volt DC electronic component) and the handheld remote **42** (a battery powered remote component) are known types of components such that a user can communicate commands to the control module **41** by operating the handheld remote **42** in a known way (e.g., by pressing buttons on the remote **42**).

[0043] The control module **41** is preferably installed on the spa **10** component of the coverlifter-outfitted spa **30** near other spa-controlling components of the spa **10** (not shown). Preferably, the control module **41** is connected to the electrical power supplied to the spa **10** for other spa purposes. Suitable electrical wiring couples electrical power from the control module **41** to the linear actuators **23A, 23B, 27A, 27B;** those linear actuators are identified respectively in the block diagram of FIG. **12** as **LA1, LA2, LA3,** and **LA4.** The user operates the handheld remote **42** in order to cause the electronic control module **41** to couple electrical power to the linear actuators **23A, 23B, 27A, 27B** in a manner achieving the desired movement of the crossbar **21,** and thereby the spa cover **11.** Based upon the foregoing description, a person having ordinary skill in the art (i.e., a PHOSITA) can readily implement the present invention using, for example, known remote control components and techniques, including, as an additional example, providing an electronic controller that operates under program control, with positional feedback and actuator synchronization.

[0044] The block diagram flow chart in FIG. **13** summarizes the methodology of the present invention for

moving a spa cover on a spa from a spa-covering position to a non-covering position. As indicated by a block **51** in FIG. **3,** the method of the present invention includes the step of providing a spa coverlifter that is installed on a spa as described above. The method proceeds, as indicated by a block **52,** by folding the spa cover in order to capture the crossbar of the coverlifter. Then, as indicated by a block **53** in FIG. **13,** the user moves the captured crossbar by remote control of the crossbar-moving assembly, to thereby move the spa cover to the non-covering position. Preferably, the user continues remote control movement of the spa cover in order to move it downwardly to a less noticeable lowered position next to the spa exterior.

[0045] FIGS. **13** and **14** illustrate a second embodiment of a coverlifter-outfitted spa having a cover-lifting apparatus constructed according to the electrically powered, remote control, single actuator aspect the present invention. The second embodiment is identified as a single-linear-actuator cover-lifting apparatus that is identified as a second coverlifter **120.** It includes electronic control components similar to those of the coverlifter **20,** but they are not shown for illustrative purposes. The second coverlifter **120** is shown installed on an existing spa **110** (e.g., a hot tub) to result in a second coverlifter-outfitted spa **130;** it has been retrofitted by the addition of the second coverlifter **120** for purposes of remote-controlled movement of a spa cover **111.** The term "single-linear-actuator" alludes to use of just a single linear actuator on each of two crossbar-moving subassemblies of the second coverlifter **120,** as described subsequently.

[0046] The second coverlifter **120** and the resulting second coverlifter-outfitted spa **130** are similar in many respects to corresponding components of the first coverlifter-outfitted spa **30** and so only significant differences are described in further detail. For convenience, reference numerals designating parts of the second coverlifter-outfitted spa **130** are increased by one hundred over reference numerals designation similar, associated, or corresponding parts of the first coverlifter-outfitted spa **30.**

[0047] The existing spa **110** includes first and second sides **110A** and **110E** that extend between a front **110B** and a back **110C** of the spa **110.** The spa cover **111** is used to cover the spa **110.** The diagrammatic perspective view of FIG. **14** shows the spa cover **111** in a spa-covering position in which it extends over the spa **110,** while FIG. **15** shows it in a non-covering position. The second coverlifter **120** includes a crossbar **121** and a crossbar-moving assembly that moves the crossbar **121** in order to thereby move the spa cover **111** between those positions. The crossbar-moving assembly includes similar first and second crossbar-moving subassemblies, each of which is mounted on a respective one of the first and second sides **110A** and **110E** of the spa **110.** Only the second crossbar-moving subassembly is visible in FIG. **14.**

[0048] The second crossbar-moving subassembly includes a crossbar-moving strut **122** that is mounted pivotally on a mounting **125B** attached to the second side **110E.** It is pivotally mounted for pivotal movement about a horizontally extending pivotal axis **126.** The mounting **125B** (and thereby the pivotal axis **126**) is located ahead of the back **110C** of the spa **110** so that it does not block or otherwise interfere with movement of the spa cover **111** to the non-covering position alongside the back **110C,** as illustrated in FIG. **15.**

[0049] In line with the single-actuator aspect of the second embodiment, a lower end portion of a linear actuator **127B** (a second of two linear actuators) is also mounted pivotally on the mounting **125B,** for pivotal movement about a horizontally extending pivotal axis **128,** where it functions as a strut-positioning member. A first linear actuator of the two linear actuators (not shown) is mounted in a similar manner on the opposite first side **110A** of the spa **110.** Remote-controlled operation of the second linear actuator **127B** (along with synchronized operation of the first linear actuator) results in movement of the spa cover from the spa-covering position shown in FIG. **14** to the non-covering position shown in FIG. **15.**

[0050] Thus, the present invention provides a spa cover-lifting apparatus on a coverlifter-outfitted spa that facilitates movement of a spa cover by a user. Although exemplary embodiments have been shown and described, a person having ordinary skill in the art may make many changes, modifications, and substitutions without necessarily departing from the spirit and scope of the invention. As for the specific terminology used to describe the exemplary embodiments, it is not intended to limit the invention; each specific term is intended to include all technical equivalents that operate in a similar manner to accomplish a similar purpose or function. For example, the terms "horizontal," "horizontally," "vertical," "vertically," "parallel," "perpendicular," and the like herein state orientations, and those terms herein include approximations of the stated orientations.

[0051] The following list summarizes some of the nomenclature developed in the foregoing description.

[0052] Spa. The term "spa" herein includes a large tub structure or small pool (i.e., a water-holding vessel), that a user can fill with water (e.g., heated water) for hydrotherapy, relaxation, or pleasure; such spas include hot tubs, swim spas, spa pools, and the like.

[0053] Spa Cover. A spa cover is a known type of structure that is used to cover the spa during periods when the spa is not in use; a spa cover can help maintain spa water temperature and prevent spa water contamination.

[0054] Hinge Portion. A hinge portion of the spa cover is a transversely extending portion of the spa cover at which a first half of the spa cover is connected to a second half of the spa cover so that the spa cover can be folded along the hinge portion.

[0055] Cover-Lifting Apparatus. A cover-lifting apparatus herein is an electrically powered apparatus that operates under remote control to facilitate movement of a

spa cover from a spa-covering position, in which the spa cover is disposed over the spa, to a non-covering position in which it is moved from the spa-covering position in order to enable normal use of the spa.

[0056] Crossbar. A crossbar is an elongated component of a cover-lifting apparatus; it has a straight-line, horizontally extending axis of elongation; when the cover-lifting apparatus is installed on the spa and the spa cover is on the spa in the spa-covering position, the axis of elongation of the crossbar extends transversely across the spa cover in a position above the hinge portion of the spa cover.

[0057] Captured Crossbar. A captured crossbar is a crossbar that has been trapped between the two halves of the spa cover as a result of the spa cover having been folded to a folded position; movement of the capture crossbar results in movement of the spa cover.

[0058] Crossbar-Moving Assembly. A crossbar-moving assembly is an assembly of components that cooperatively move the crossbar for purposes of moving the spa cover from the non-covering position.

[0059] Crossbar-Moving Subassembly. A crossbar-moving subassembly is one of two subassemblies of the crossbar-moving assembly, such that a first crossbar-moving subassembly of the two subassemblies is attached to the spa on a first side of the spa and a second crossbar-moving subassembly of the two subassemblies is attached to the spa on an opposite second side of the spa.

[0060] Crossbar-Moving Strut. A crossbar-moving strut is an extendible component of the crossbar-moving subassembly that is attached to the crossbar; it is electrically powered with a linear actuator in order to serve the function of moving the crossbar under remote control; the illustrated crossbar-moving strut includes the telescoping combination of two tubes such that one tube slides axially within the other under force applied by a linear actuator.

[0061] Strut-Positioning Member. A strut-positioning member herein is a component of the crossbar-moving subassembly that is attached to the crossbar-moving strut; it serves the function of changing the position of the crossbar-moving strut under force applied by a linear actuator.

[0062] Linear Actuator. A linear actuator is a known type of component that produces motion in a straight line in response to the action of an electrically powered motor that is part of the linear actuator.

[0063] Synchronized Movement. The terms synchronized movement and synchronized operation of the linear actuators, and similar terms, mean that the linear actuators move the crossbar in such a way, for spa cover-repositioning purposes, that the axis of elongation of the crossbar is maintained substantially perpendicular to the XY plane of the reference XYZ Cartesian coordinate system included in the drawings.

[0064] Electronic Control Components. Electronic control components include the components as described above with reference to FIG. **12;** preferably, they include a controller that operates under program control.

[0065] Coverlifter-Outfitted Spa. A coverlifter-outfitted spa (i.e., a COS) is a spa on which is mounted an electrically powered, remotely controlled, cover-lifting apparatus constructed according to the present invention.

[0066] Spa-Covering Position. The term SPA-COVERING POSITION means a position of the spa cover in which the spa cover is unfolded and resting atop the spa for purposes of covering the spa, as shown, for example, in FIGS. **1, 2, 6,** and **7**).

[0067] Non-Covering Position. The NON-COVERING POSITION of the spa cover is a position in which the spa cover has been folded and moved from the SPA-COVERING POSITION, so that the spa cover is not covering the spa as it does in the SPA-COVERING POSITION.

[0068] Folded Position. The FOLDED POSITION of the spa cover is a position atop the spa in which a first half of the spa cover has been folded over the second half of the spa cover in order to capture the crossbar, as shown, for example, in FIG. **8.**

[0069] Partially Moved Position. The PARTIALLY MOVED POSITION of the spa cover is a position in which the spa cover has been moved from the FOLDED POSITION toward the RAISED NON-COVERING POSITION of the spa cover, as shown, for example, in FIG. **9.**

[0070] Raised Non-Covering Position. The RAISED NON-COVERING POSITION of the spa cover is a position in which the folded spa cover has been moved from the PARTIALLY MOVED POSITION to a position in which it does not cover the spa, but before it has been lowered to the LOWERED NON-COVERING POSITION, as shown, for example, in FIG. **10.**

[0071] Lowered Non-Covering Position. The position of the spa cover referred to as a LOWERED NON-COVERING POSITION is a position in which the folded spa cover has been lowered from the RAISED NON-COVERING POSITION to a position in which it is out-of-the-way behind the back of the spa, as shown, for example, in FIG. **11.**

[0072] Embodiments of the present invention have been described with particular reference to the example illustrated. However, it will be appreciated that variations and modifications may be made to the examples described within the scope of the present claims.

Claims

1. A cover-lifting apparatus for moving a spa cover on a spa from a spa-covering position of the spa cover, in which the spa cover is disposed over the spa, to a non-covering position, in which it is moved from the spa-covering position, in order to enable normal use of the spa, the cover-lifting apparatus comprising:

a crossbar for placement over a hinge portion of the spa cover when the spa cover is on the spa in the spa-covering position, so that the act of a user folding a first half of the spa cover over a second half of the spa cover results in a captured crossbar disposed in between the first and second halves;

an electrically powered crossbar-moving assembly connected to the crossbar for moving the captured crossbar under user control in order to thereby move the spa cover from the spa-covering position to the non-covering position, said crossbar-moving assembly including a first crossbar-moving subassembly for attachment to a first side of the spa in a position forward of a back of the spa, and a second crossbar-moving assembly for mounting on a second side of the spa in a position forward of the back of the spa, so that the first and second crossbar-moving subassemblies do not extend behind the back of the spa in positions to interfere with movement of the spa cover to a position alongside the back of the spa; and

an electronic control module for operating the first and second crossbar-moving subassemblies by remote control.

2. A cover-lifting apparatus as recited in claim **1,** wherein the crossbar-moving assembly includes at least a first electrically powered linear actuator on the first subassembly and at least a second electrically powered linear actuator on the second subassembly.

3. A cover-lifting apparatus as recited in claim 1, wherein the crossbar-moving assembly includes at least a first pair of electrically powered linear actuators on the first crossbar-moving subassembly, and at least a second pair of electrically powered linear actuators on the second crossbar-moving subassembly.

4. A cover-lifting apparatus as recited in claim **3,** wherein:

the first crossbar-moving sub assembly includes a first crossbar-moving strut and a first strut-positioning member; and

the second crossbar-moving subassembly includes a second crossbar-moving strut and a second strut-positioning member;

wherein the electronic control module operates said first and second crossbar-moving struts and said first and second strut-positioning members under user control in order to thereby move the crossbar for cover-moving purposes.

5. A coverlifter-outfitted spa, comprising:

a spa;

a spa cover on the spa; and

a cover-lifting apparatus on the spa;

wherein the spa cover includes a first half, a second half, and a hinge portion intermediate and attached to the first and second halves;

wherein the cover-lifting apparatus includes a crossbar that is not attached to the spa cover, said crossbar having a length sufficient to span the spa cover along the hinge portion of the spa cover, so that when the crossbar is in a position in which the crossbar extends over the hinge portion of the spa cover when the spa cover is in the spa-covering position, the act of folding the first half of the spa cover over the second half of the spa cover results in the crossbar being captured between the first and second halves as a captured crossbar; and

wherein the cover-lifting apparatus includes an electrically powered crossbar-moving assembly for moving the captured crossbar under remote control of a user in order to thereby move the spa cover from the spa-covering position to the non-covering position.

6. A coverlifter-outfitted spa as recited in claim 5, wherein the crossbar-moving assembly includes:

a first subassembly on a first side of the spa that is connected to a first end of the crossbar; and

a second subassembly on a second side of the spa that is connected to a second end of the crossbar; and

a combination of components for powering the first and second subassemblies electrically under remote control of the user.

7. A coverlifter-outfitted spa as recited in claim **6,** wherein the crossbar-moving assembly includes at least a first electrically powered linear actuator on the first subassembly and at least a second electrically powered linear actuator on the second subassembly.

8. A coverlifter-outfitted spa as recited in claim **7,** wherein the crossbar-moving assembly includes at least a first pair of electrically powered linear actuators on the first subassembly and at least a second pair of electrically powered linear actuators on the second subassembly.

9. A coverlifter-outfitted spa as recited in claim **5,** further comprising an electronic control module for operating the first and second crossbar-moving subassemblies by remote control.

10. A method for moving a spa cover on a spa from a spa-covering position to a non-covering position, said spa having a front and a back, together with a

first side and a second side that extend between the front and the back, the method comprising:

providing a cover-lifting apparatus that includes a crossbar and a crossbar-moving assembly that is electrically powered and remotely controlled, which cover-lifting apparatus is mounted on the spa so that the crossbar extends transversely over a hinge portion of the spa cover when the spa cover is in the spa-covering position;

folding a first half of the spa cover over a second half of the spa cover in order to thereby capture the crossbar in between the first and second halves of the spa cover as a captured crossbar; and

moving the captured crossbar by remote control operation of the crossbar-moving assembly in order to thereby move the spa cover from the spa-covering position to the non-covering position.

11. A method as recited in claim **10,** wherein the step of providing a cover-lifting apparatus includes providing a first crossbar-moving subassembly that is mounted on the first side of the spa, and providing a second crossbar-moving subassembly that is mounted on the second side of the spa, so that said first and second crossbar-moving subassemblies are not mounted on the back of the spa, thereby to avoid interference by the crossbar-moving subassemblies with movement of the spa cover downwardly to a lowered non-covering position alongside the back of the spa.

12. A method as recited in claim **11,** wherein the step of providing a crossbar-moving assembly includes providing an electrically powered crossbar-moving assembly having multiple linear actuators.

13. A method as recited in claim **11,** wherein the step of moving the captured crossbar includes lowering the spa cover to an out-of-the-way position along the back of the spa.

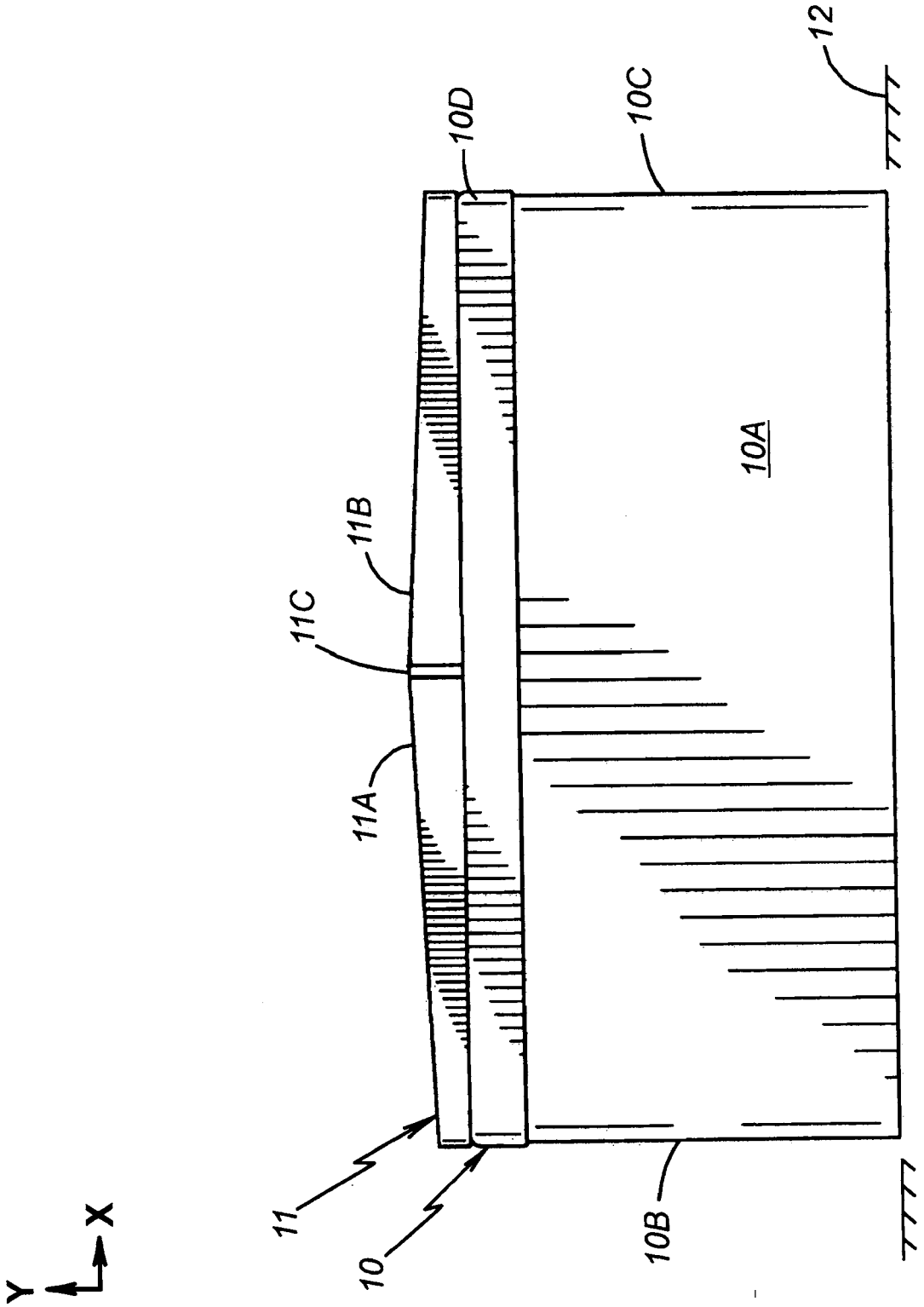

FIG. 1 - Prior Art

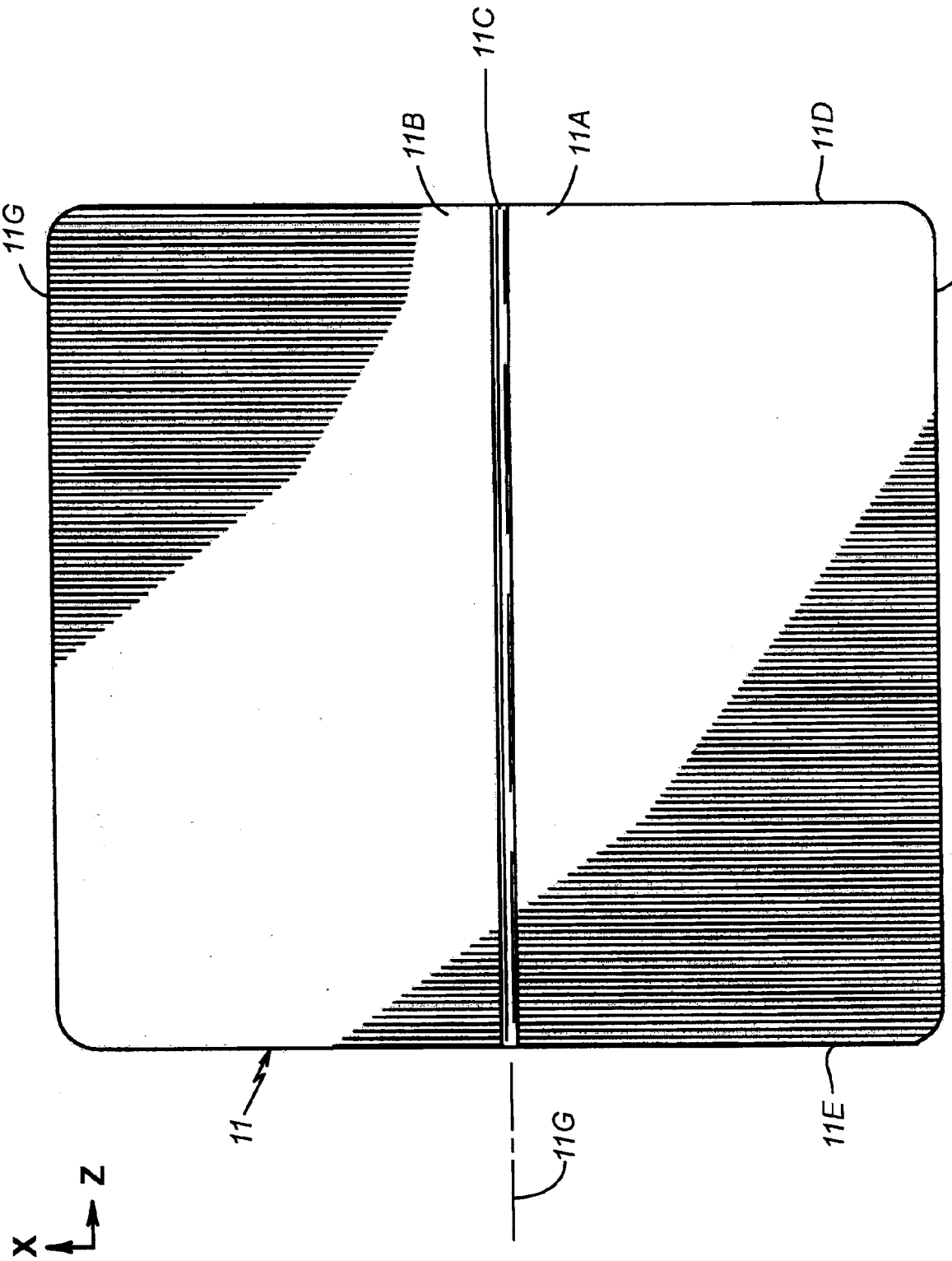

FIG. 2 - Prior Art

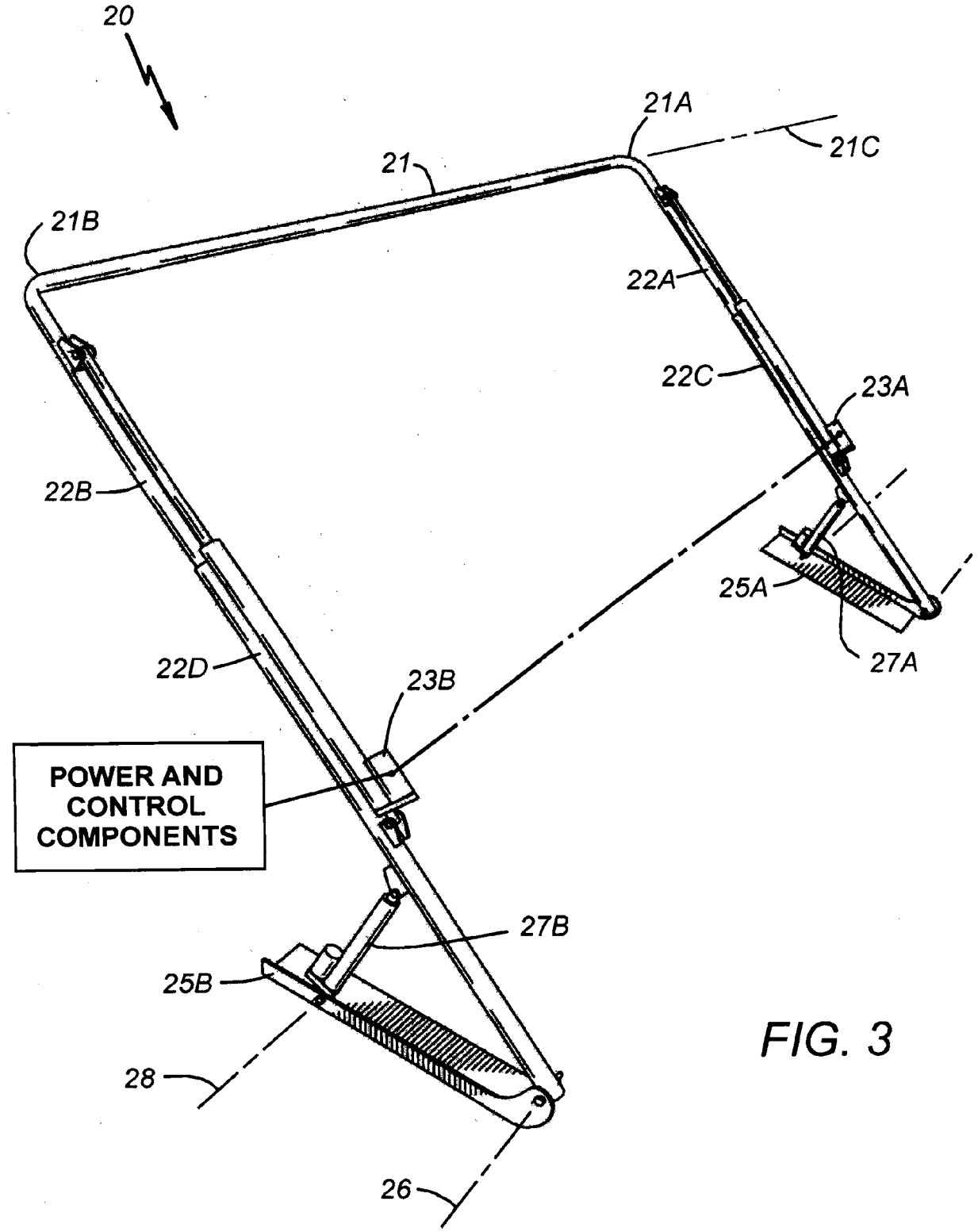
20
21A
21C
21
21B
22A
22C
23A
22B
25A
27A
22D
23B
POWER AND CONTROL COMPONENTS
27B
25B
28
26

FIG. 3

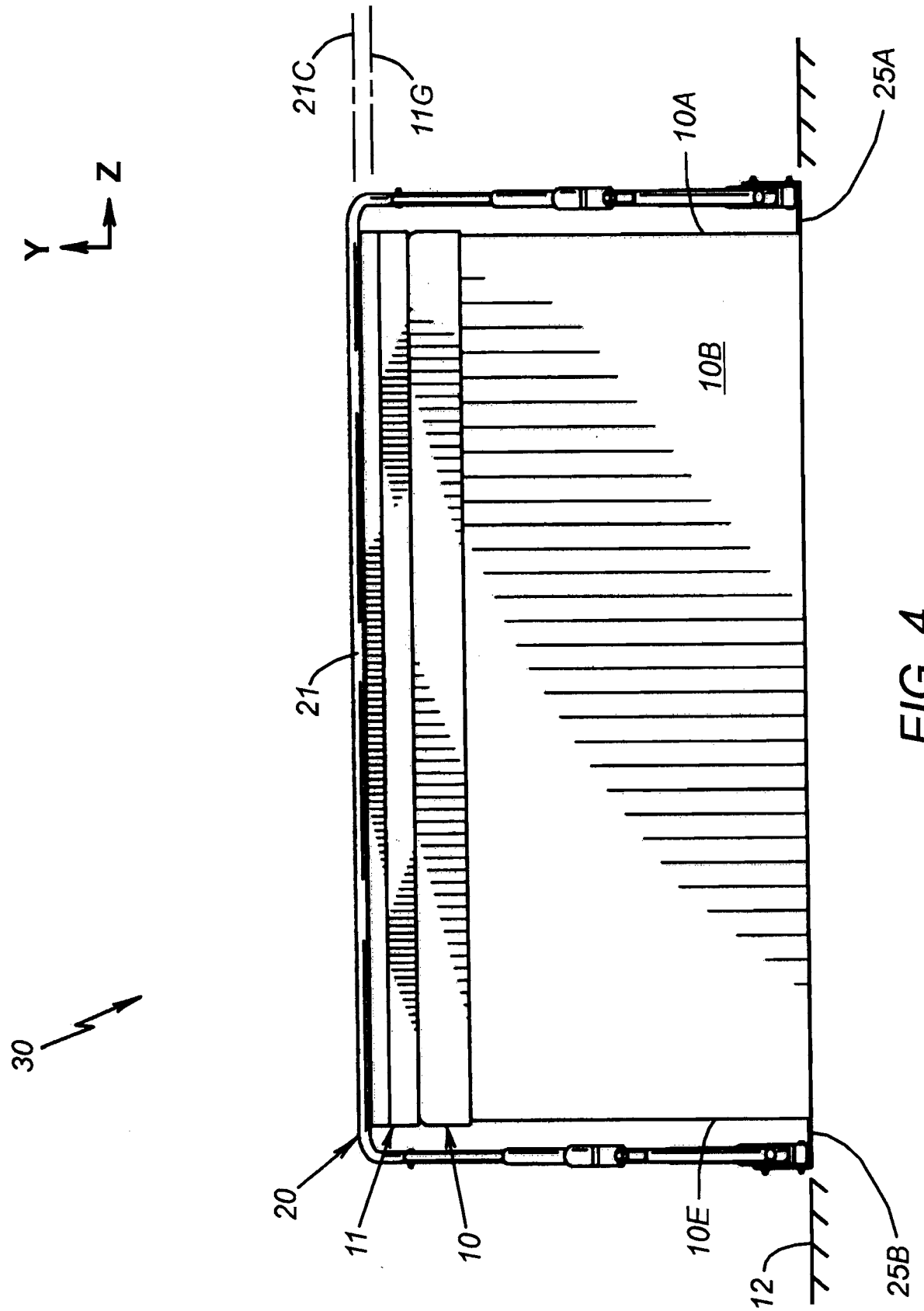

FIG. 4

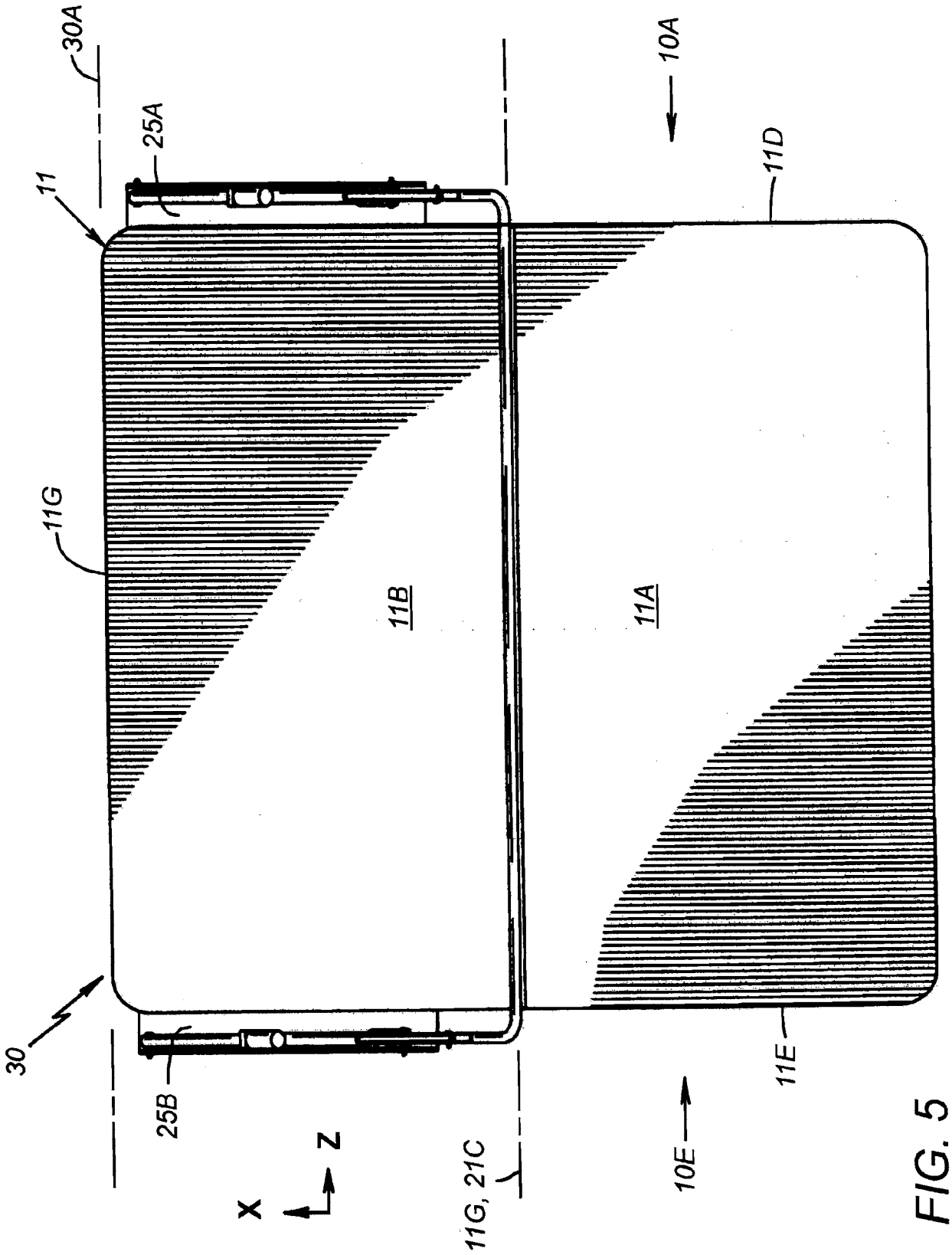

FIG. 5

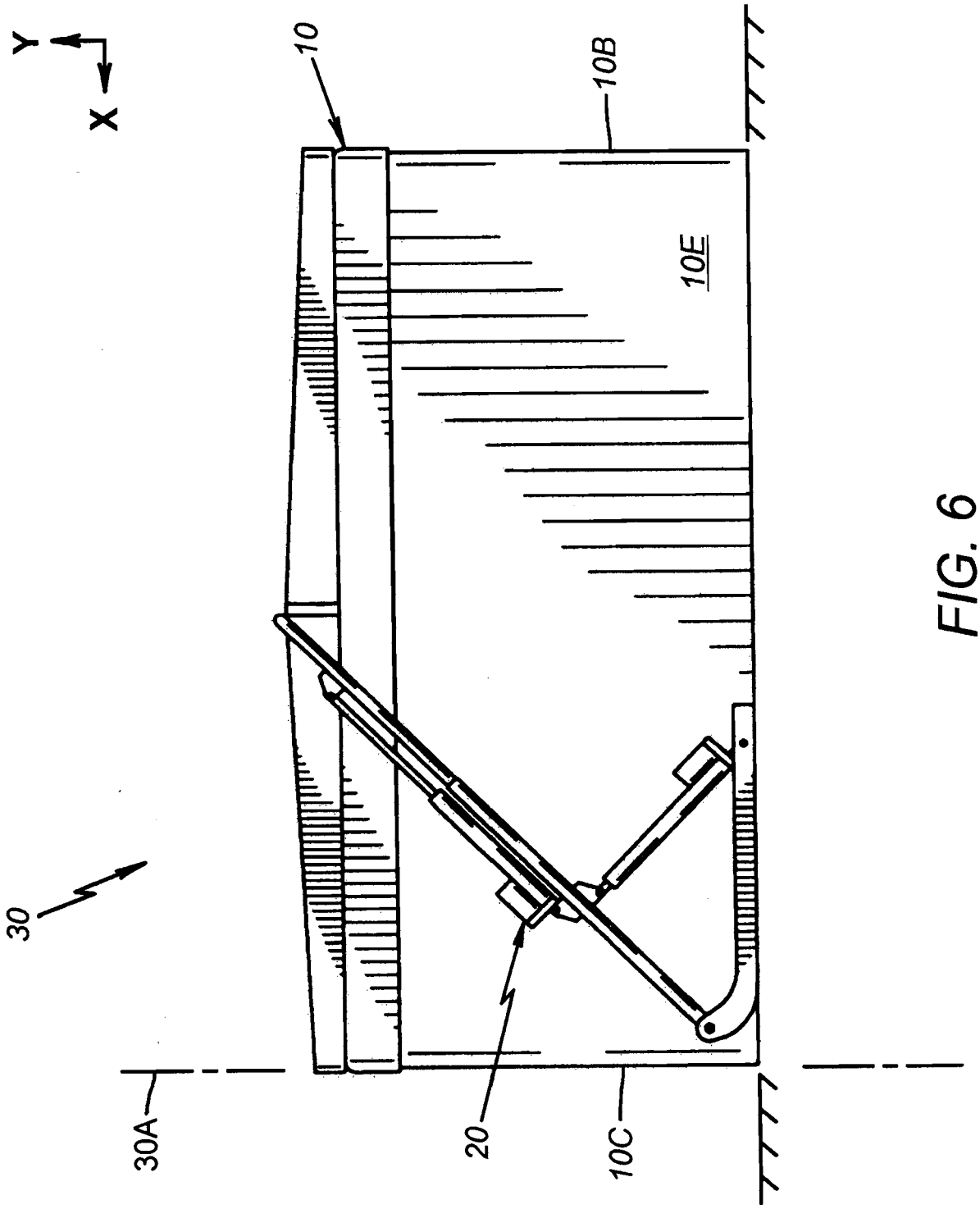

FIG. 6

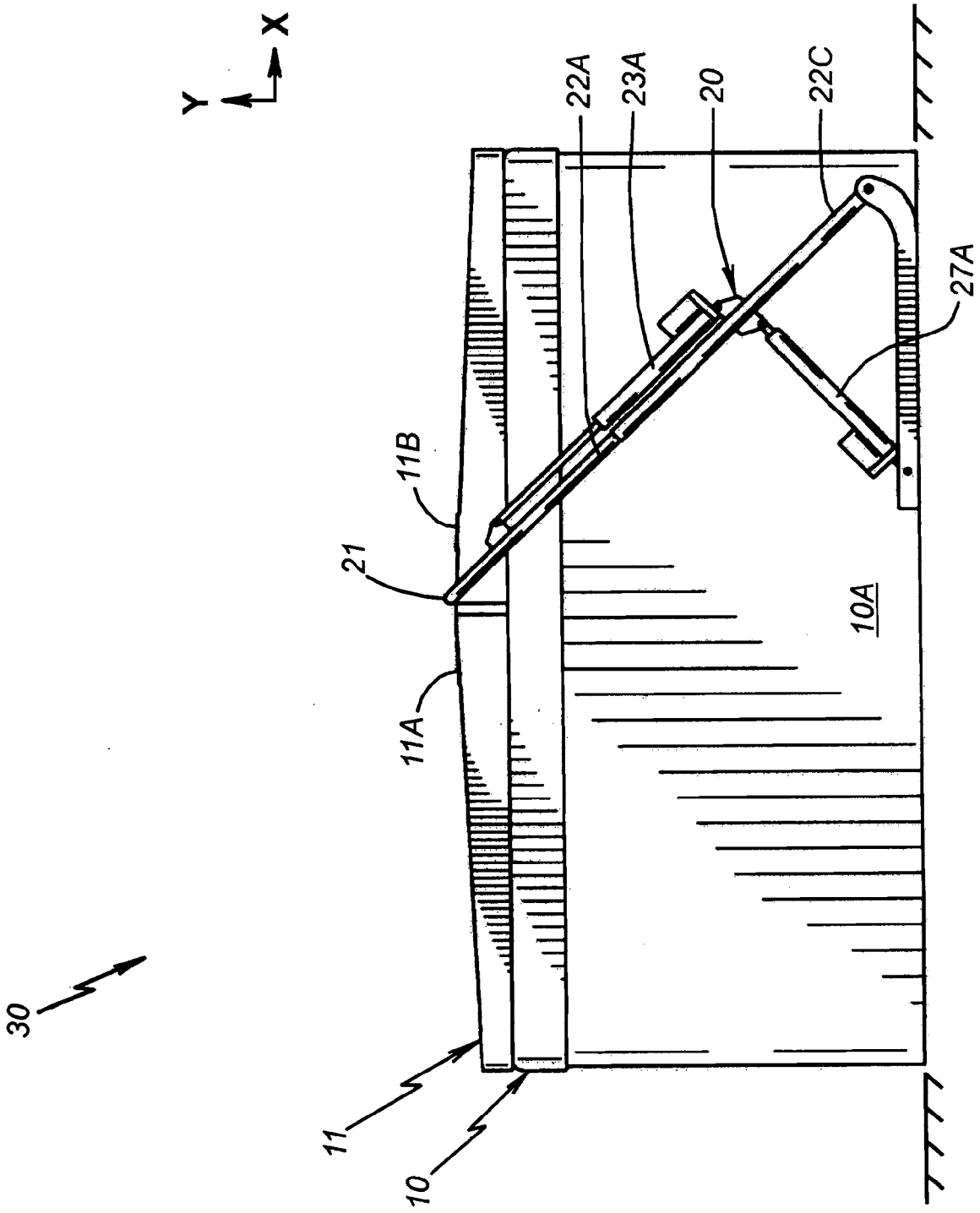

FIG. 7

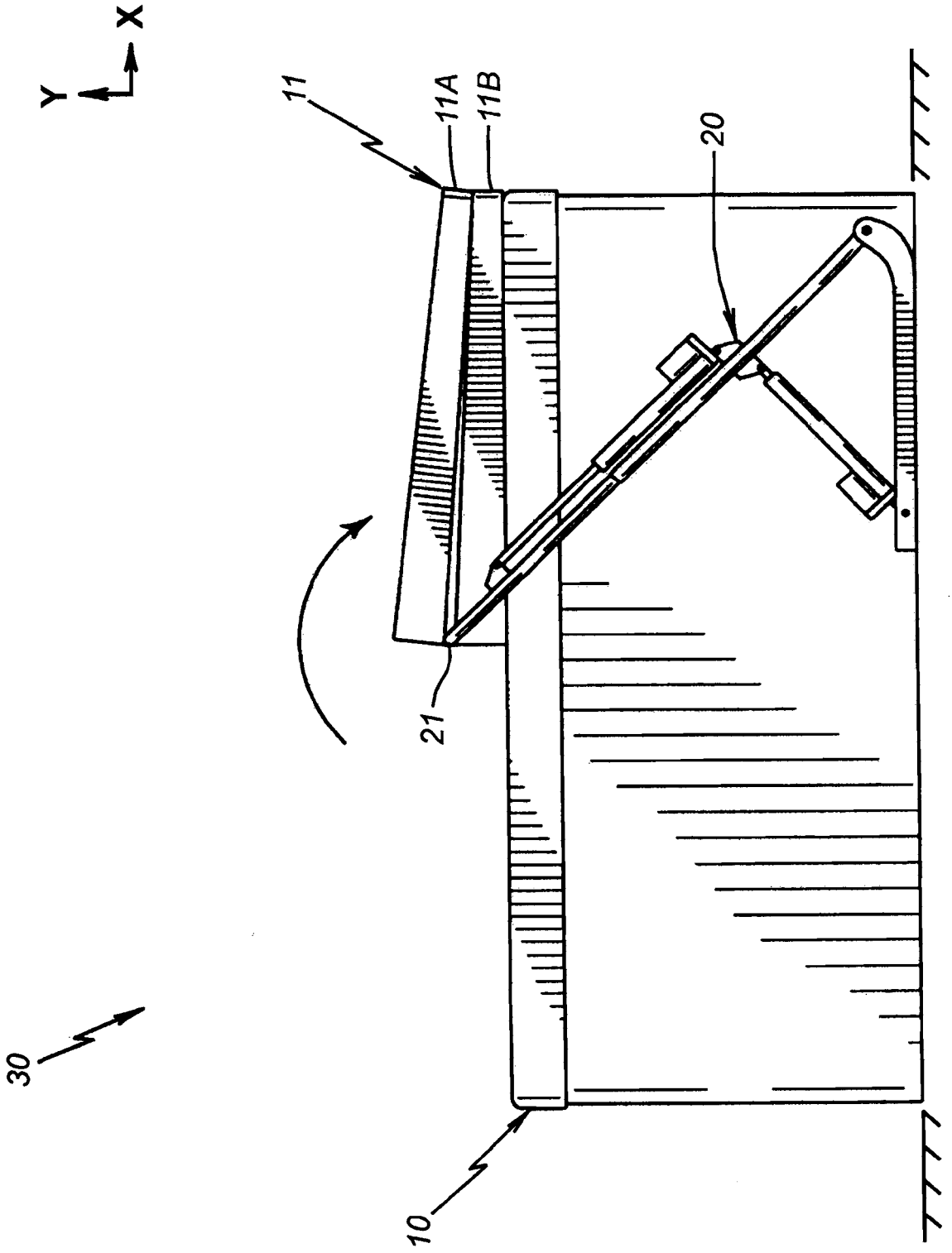

FIG. 8

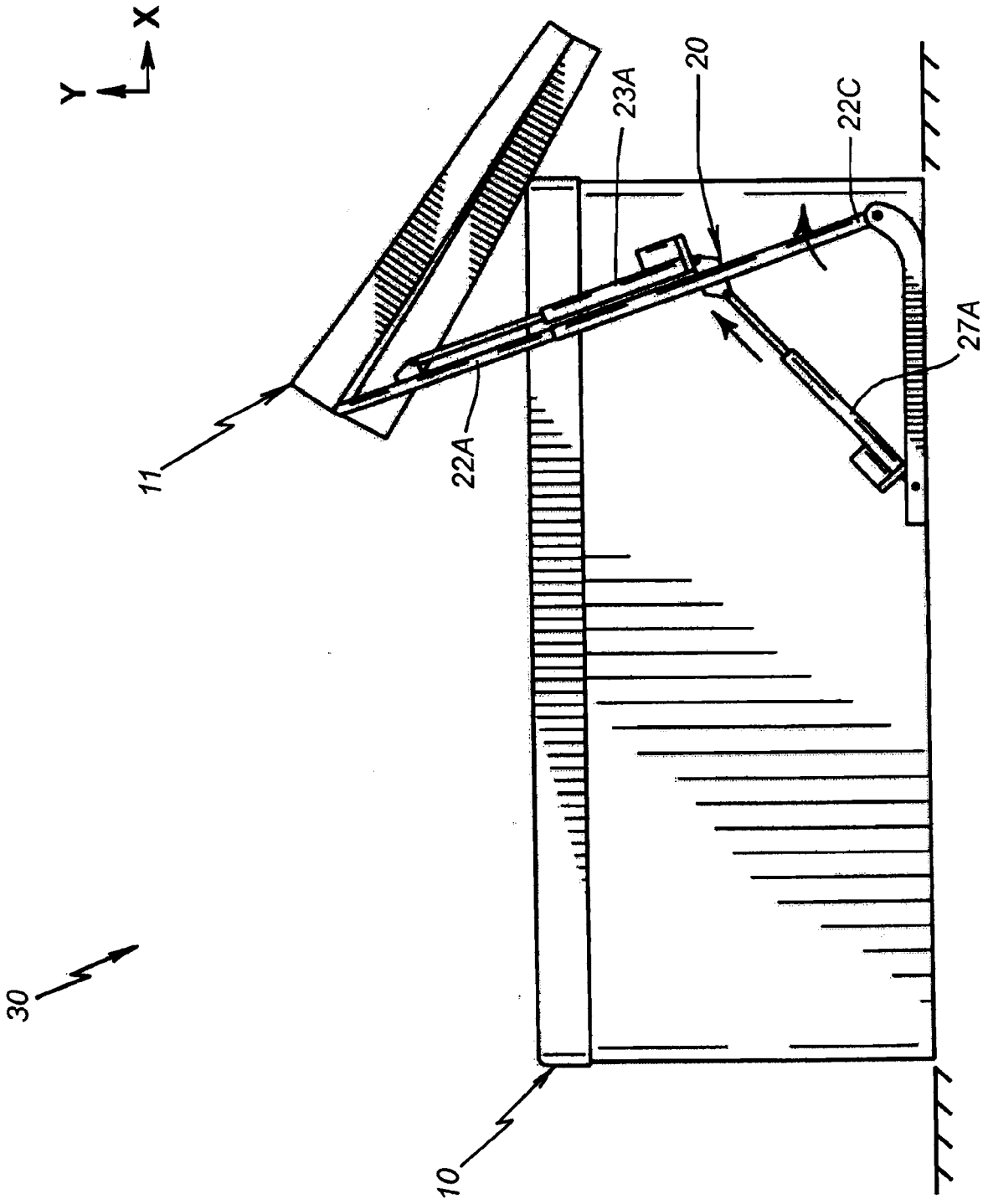

FIG. 9

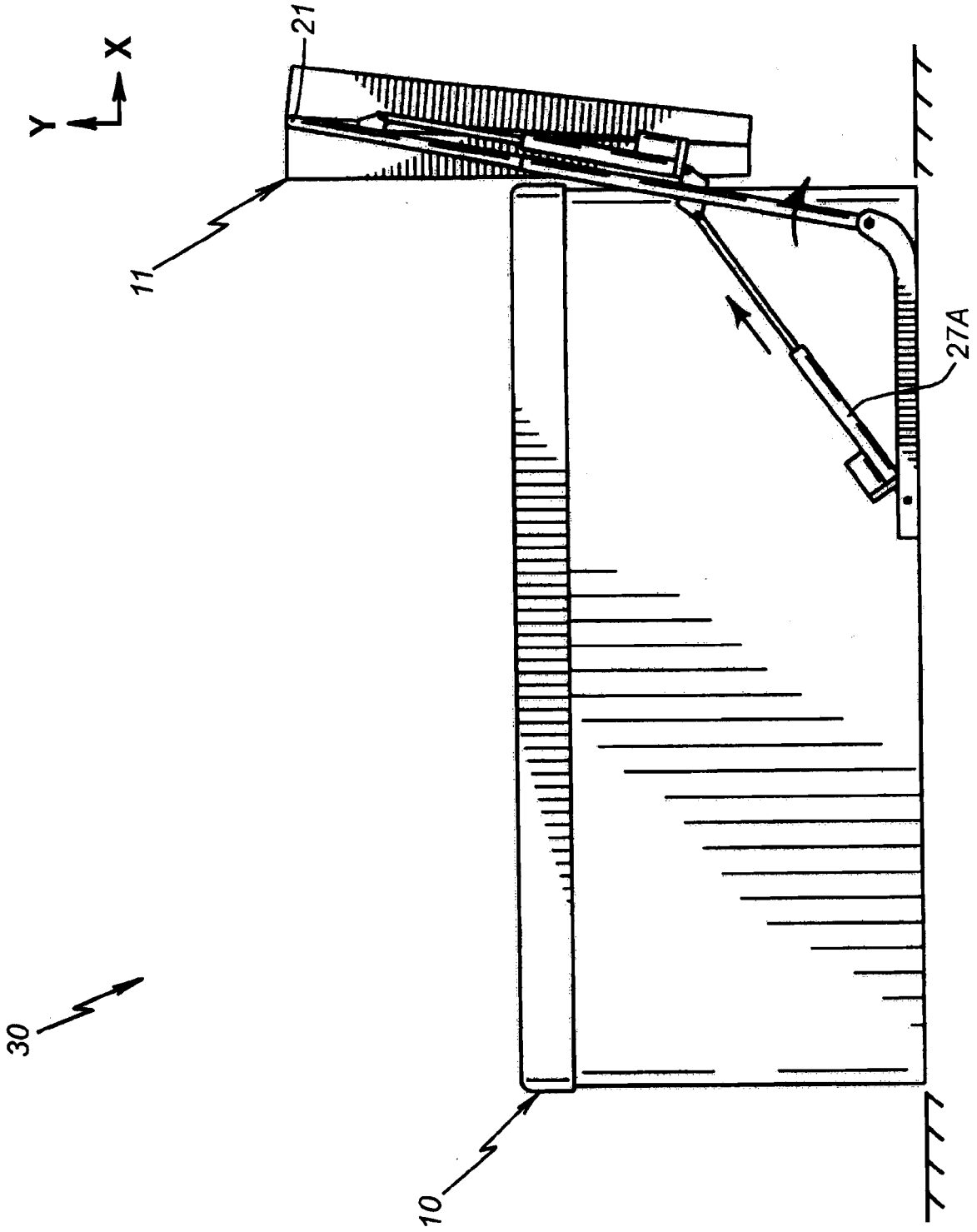

FIG. 10

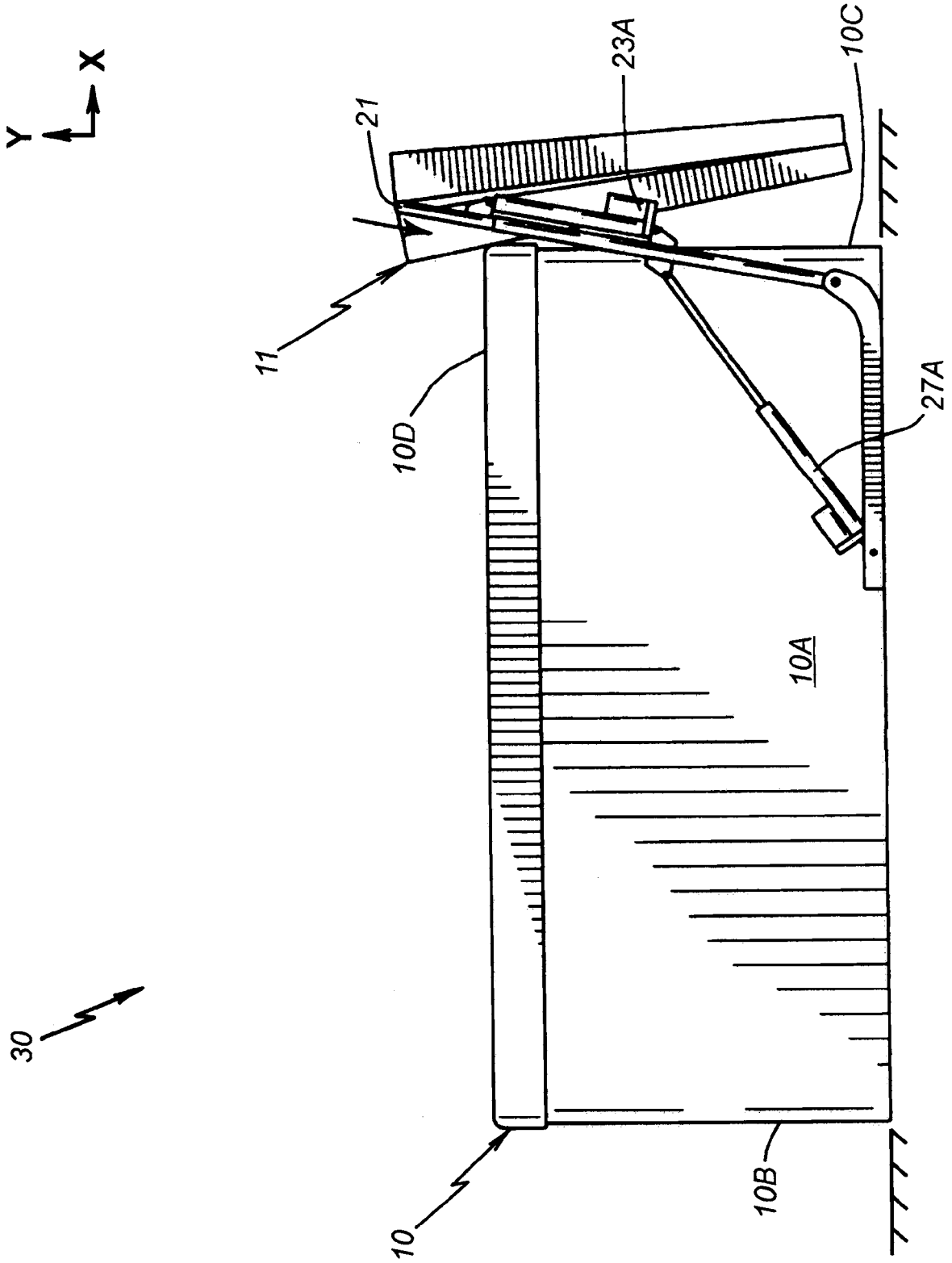

FIG. 11

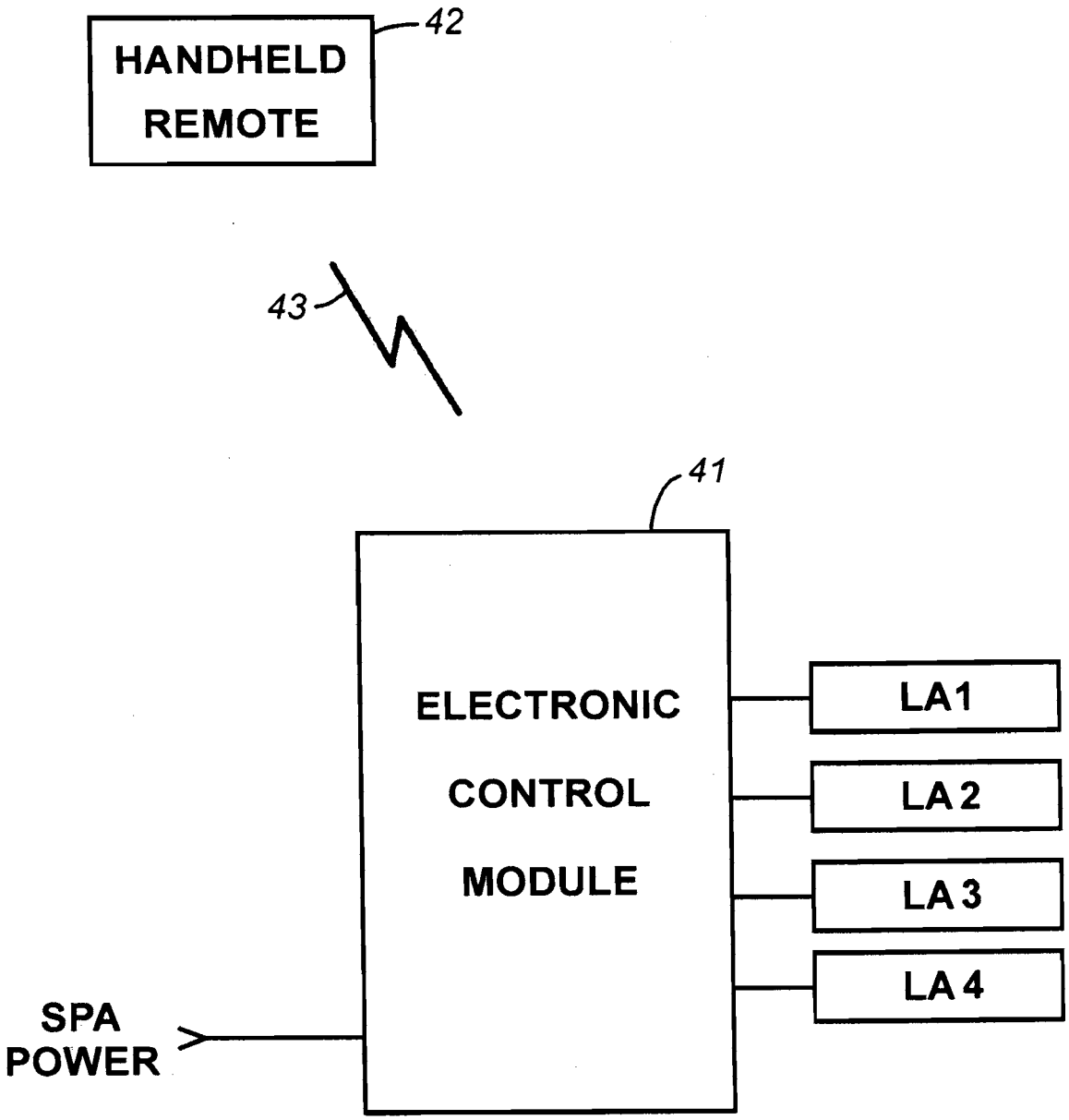
HANDHELD
REMOTE
42
43
41
ELECTRONIC
CONTROL
MODULE
LA1
LA2
LA3
LA4
SPA
POWER

FIG. 12

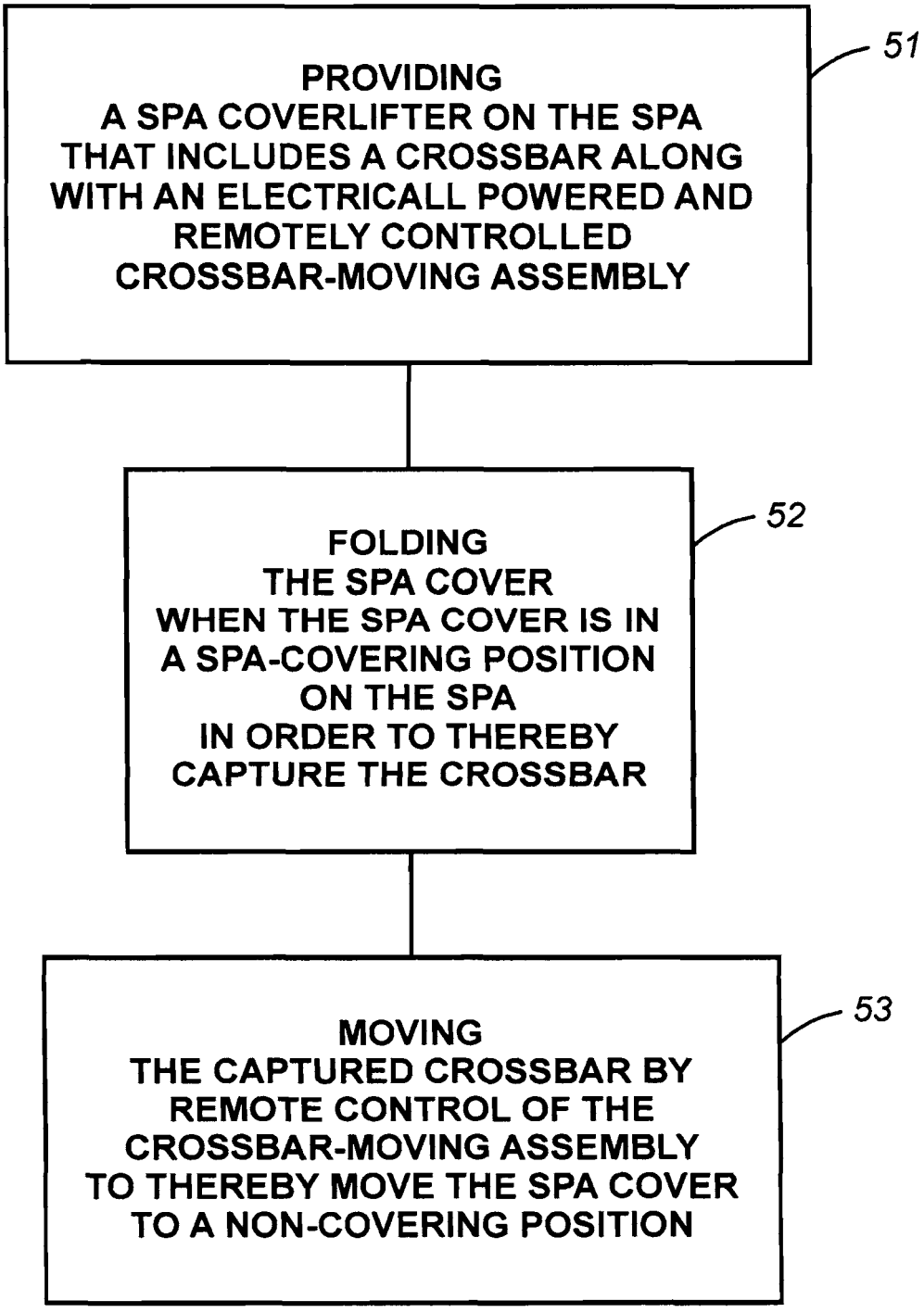
PROVIDING
A SPA COVERLIFTER ON THE SPA
THAT INCLUDES A CROSSBAR ALONG
WITH AN ELECTRICALL POWERED AND
REMOTELY CONTROLLED
CROSSBAR-MOVING ASSEMBLY
51
FOLDING
THE SPA COVER
WHEN THE SPA COVER IS IN
A SPA-COVERING POSITION
ON THE SPA
IN ORDER TO THEREBY
CAPTURE THE CROSSBAR
52
MOVING
THE CAPTURED CROSSBAR BY
REMOTE CONTROL OF THE
CROSSBAR-MOVING ASSEMBLY
TO THEREBY MOVE THE SPA COVER
TO A NON-COVERING POSITION
53

FIG. 13

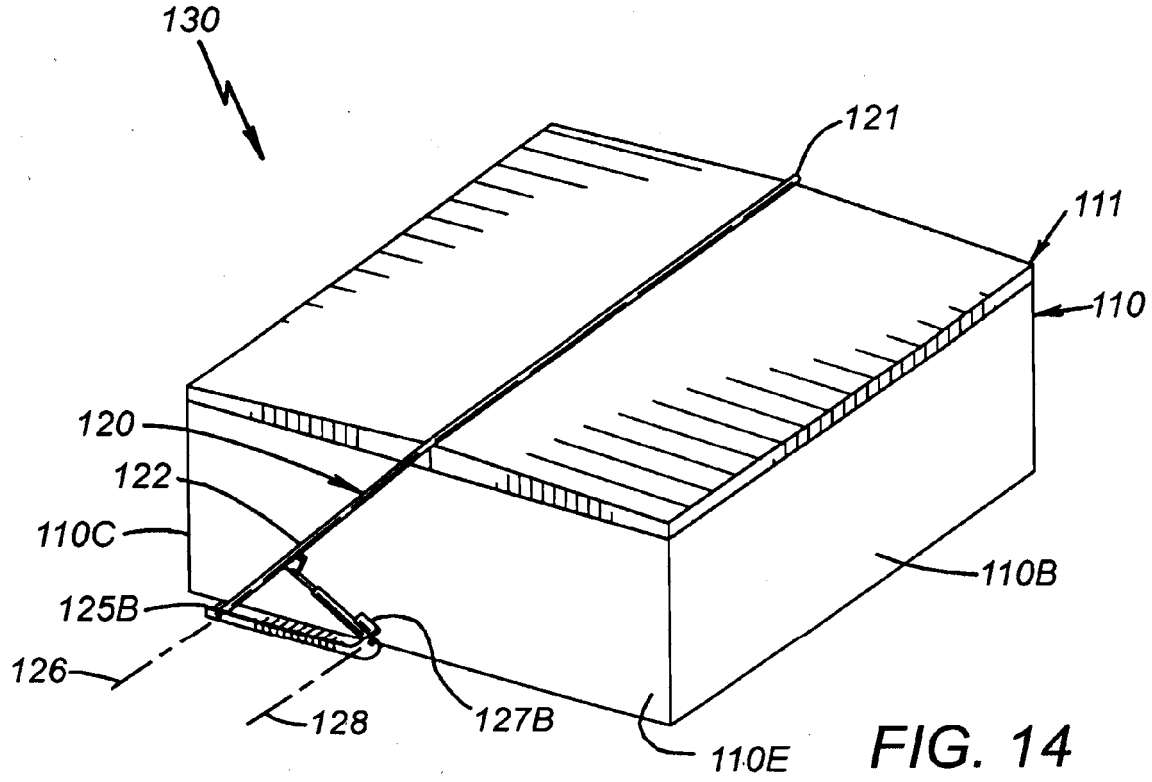
130
121
111
110
120
122
110C
125B
126
128
127B
110E
110B

FIG. 14

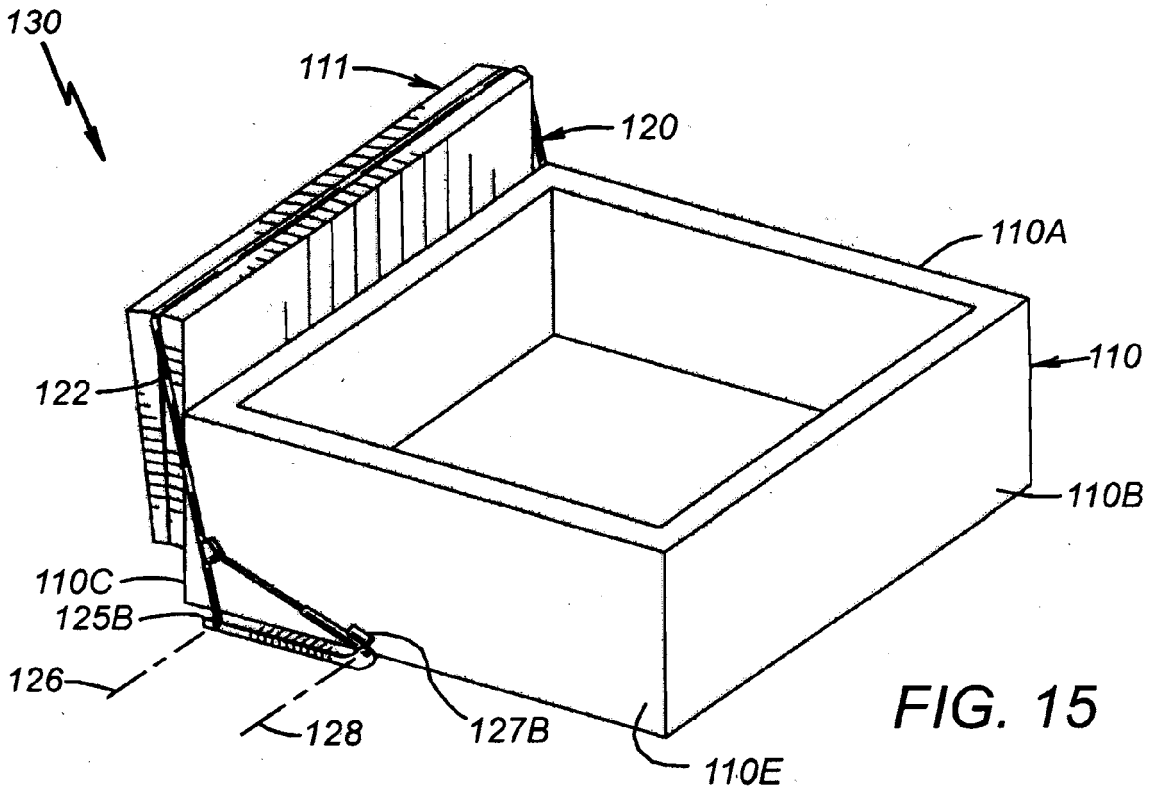
130
111
120
110A
110
122
110B
110C
125B
126
128
127B
110E

FIG. 15

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 18 2188

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2007/107118 A1 (TUDOR E J [US]) 17 May 2007 (2007-05-17)	1-3,5-13	INV. E04H4/08
A	* the whole document *	4	
X	US 2006/162060 A1 (COLEMAN JOHN [US] ET AL) 27 July 2006 (2006-07-27)	1-3,5-13	
A	* the whole document *	4	
X	US 2014/289954 A1 (WYRICK JUSTIN [US]) 2 October 2014 (2014-10-02)	1-3,5-13	
A	* figures 1,4,11A-11C * * paragraphs [0024] - [0030], [0033] *	4	

TECHNICAL FIELDS SEARCHED (IPC)

E04H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 February 2018	Schnedler, Marlon

CATEGORY OF CITED DOCUMENTS

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