



US 20180235360A1

(19) **United States**

(12) **Patent Application Publication**  
**Li**

(10) **Pub. No.: US 2018/0235360 A1**

(43) **Pub. Date: Aug. 23, 2018**

(54) **ADAPTABLE WORKSTATION**

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(21) Appl. No.: **15/691,734**

(22) Filed: **Aug. 30, 2017**

(30) **Foreign Application Priority Data**

Aug. 30, 2016 (CN) ..... 201620996963.6

**Publication Classification**

(51) **Int. Cl.**

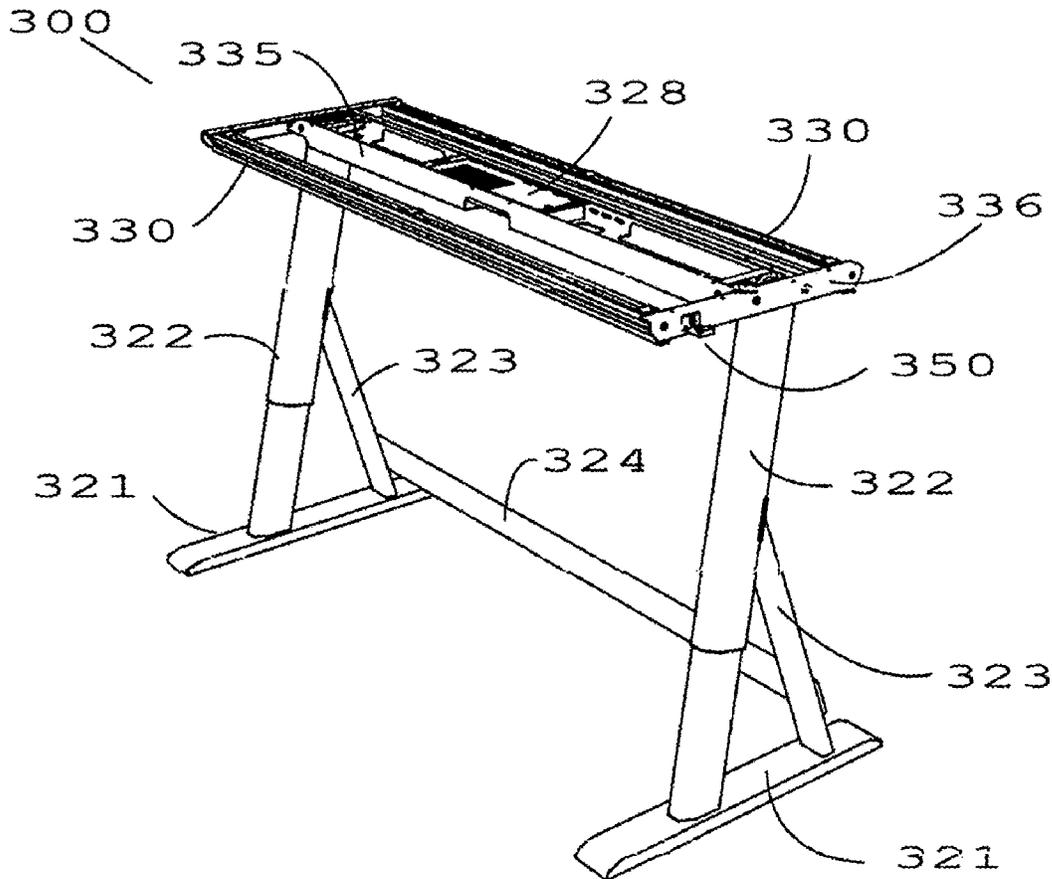
<i>A47B 21/02</i>	(2006.01)
<i>A47B 21/06</i>	(2006.01)
<i>A47B 9/00</i>	(2006.01)

(52) **U.S. Cl.**

CPC ..... *A47B 21/02* (2013.01); *A47B 21/06* (2013.01); *A47B 2200/0056* (2013.01); *A47B 2200/0061* (2013.01); *A47B 9/00* (2013.01)

(57) **ABSTRACT**

Disclosed are designs and improvements in workstation technology which allows for an individualized approach to a sit-stand workstations that have more efficient raising and lowering capabilities, smarter technology, designs and accessories. The workstations described are versatile and intelligently designed in either a four-legged (Quattro) design or a two-legged (Duo) design with improved liner actuator motor capabilities to independently control each leg in a more efficient manner. Additionally, customizable options including storage management, cord management, and high-tech assistance options are disclosed.



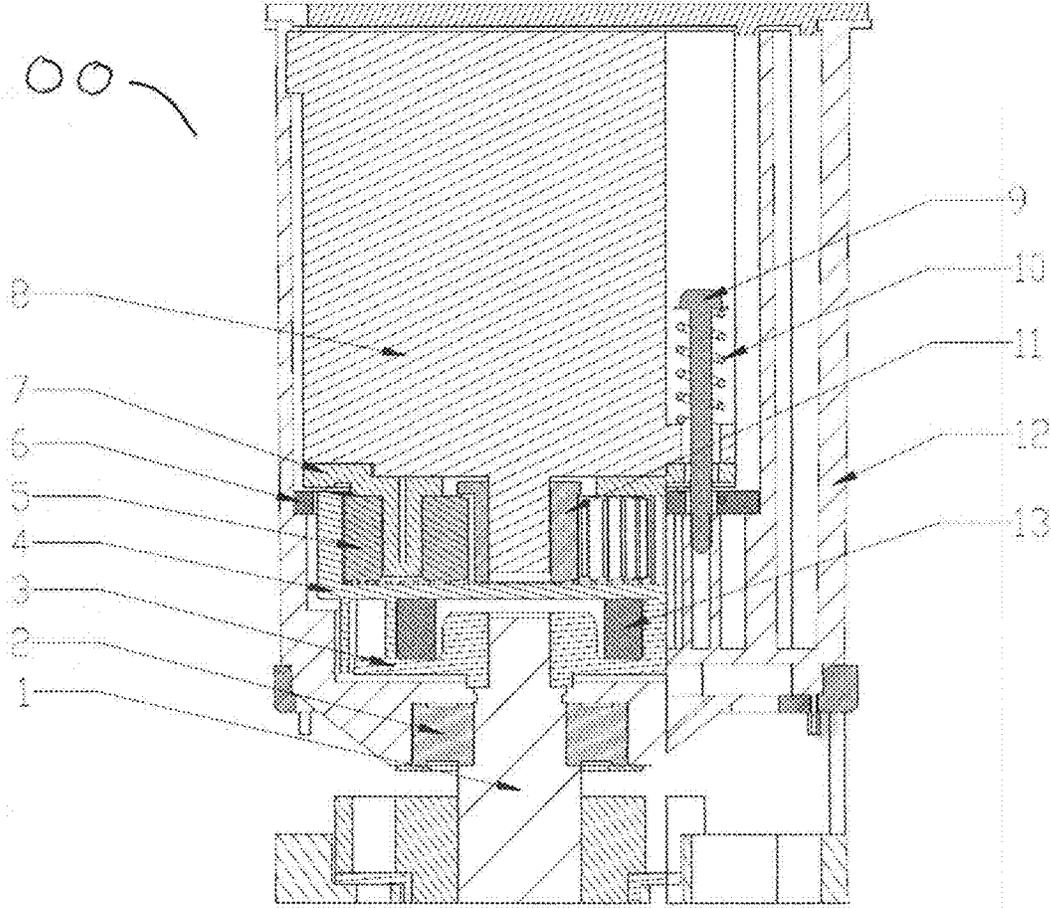


FIGURE 1

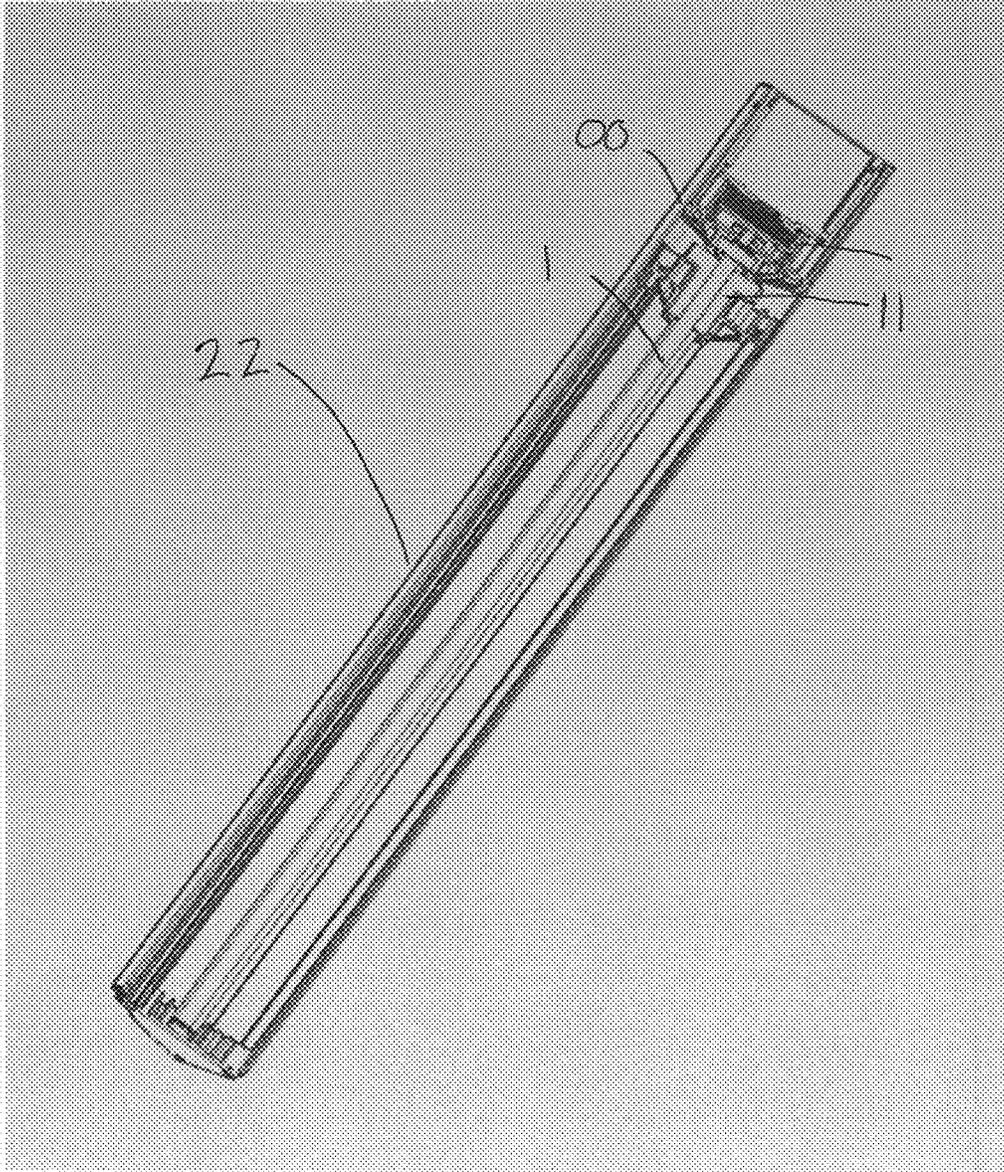


Figure 2

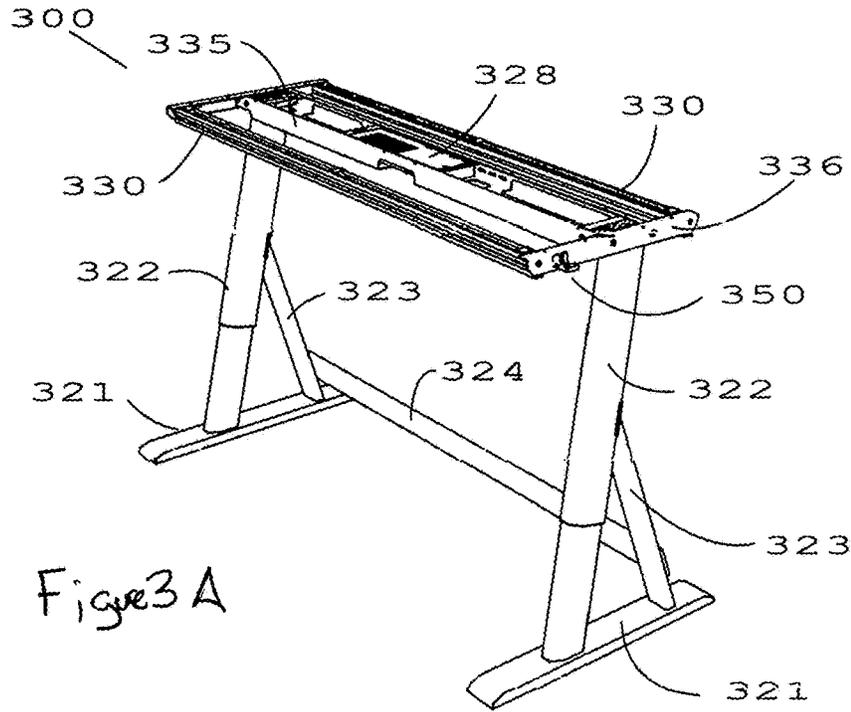


Figure 3A

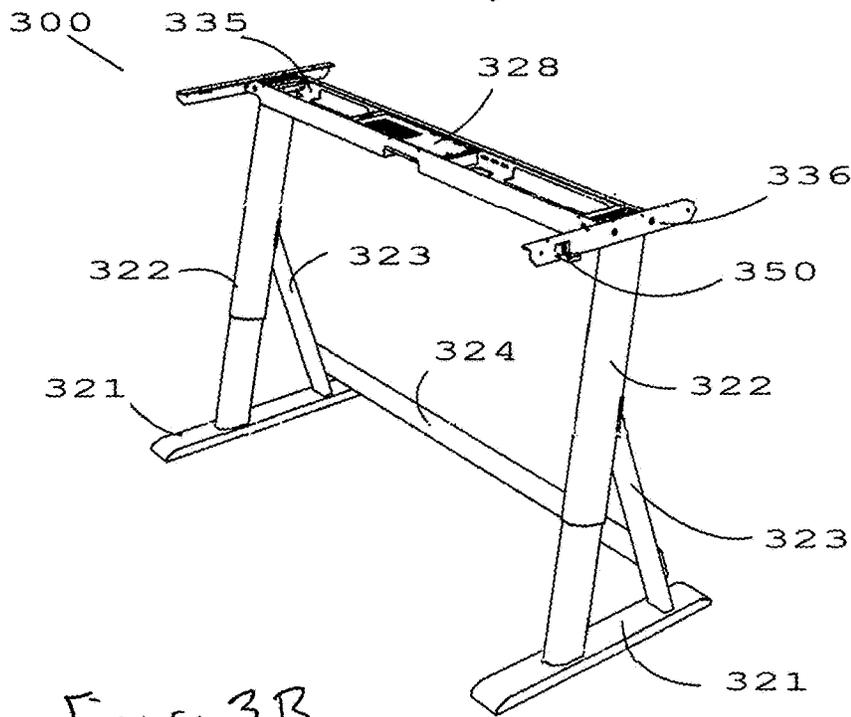


Figure 3B

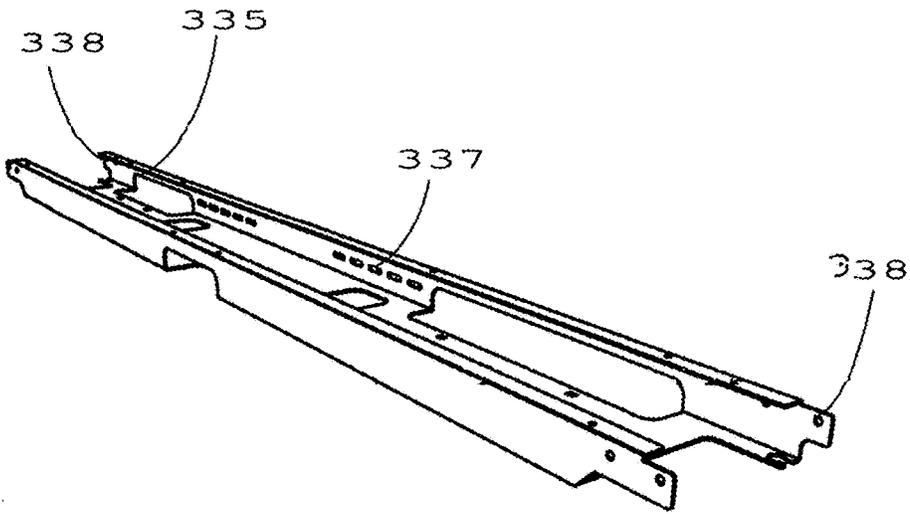


Figure 3C

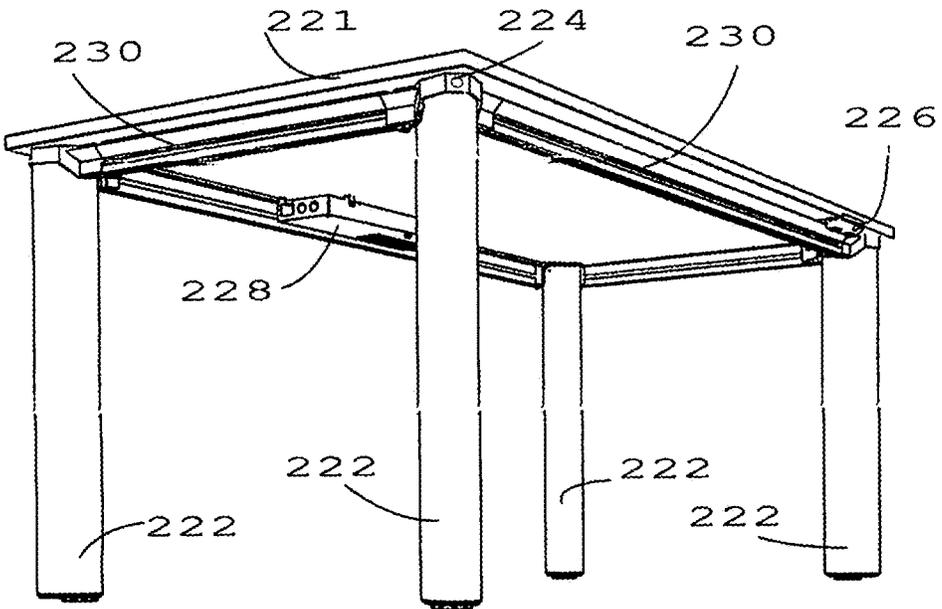


Figure 4

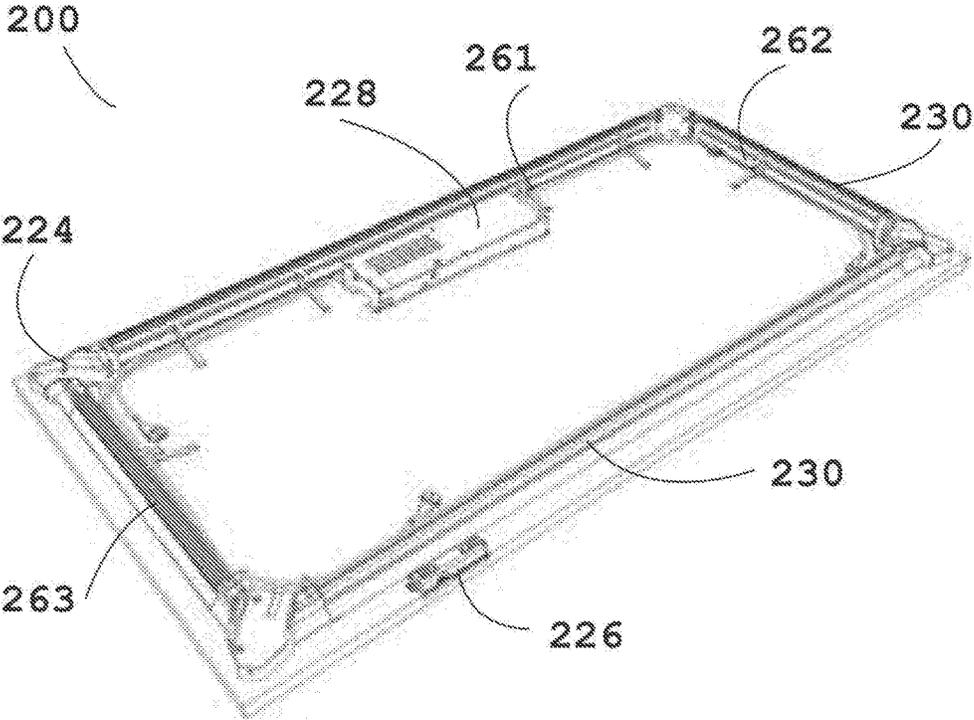


FIGURE 5

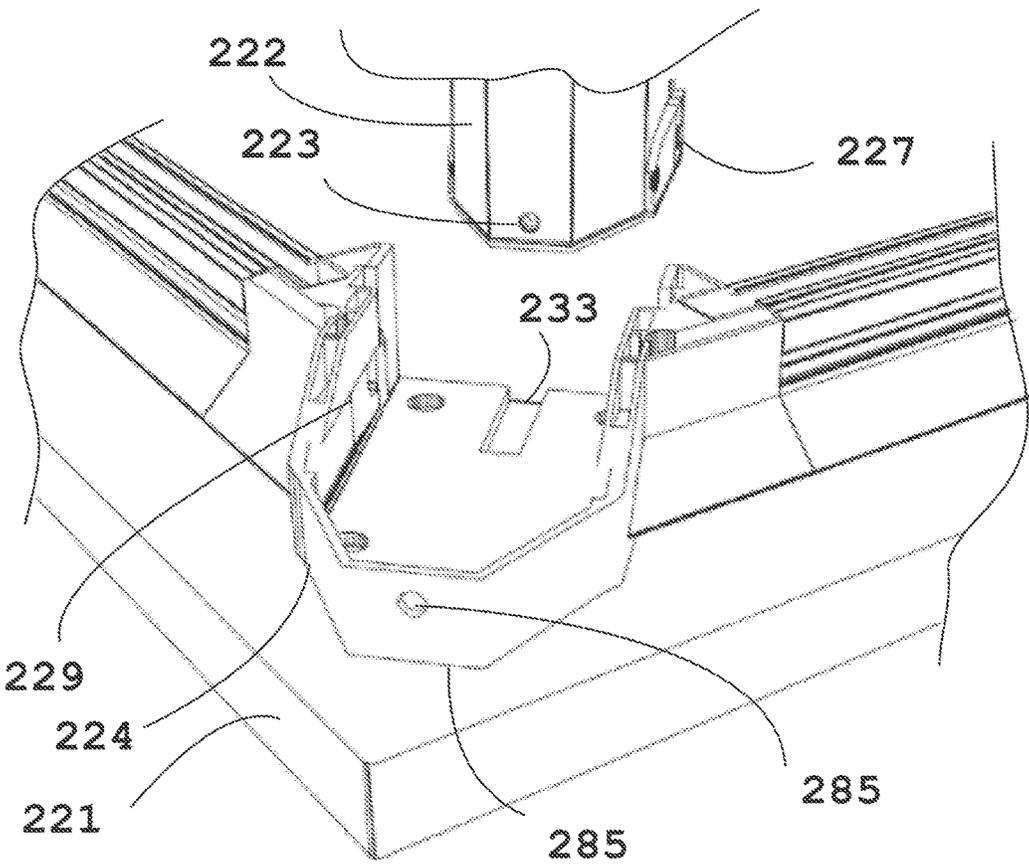


FIGURE 6A

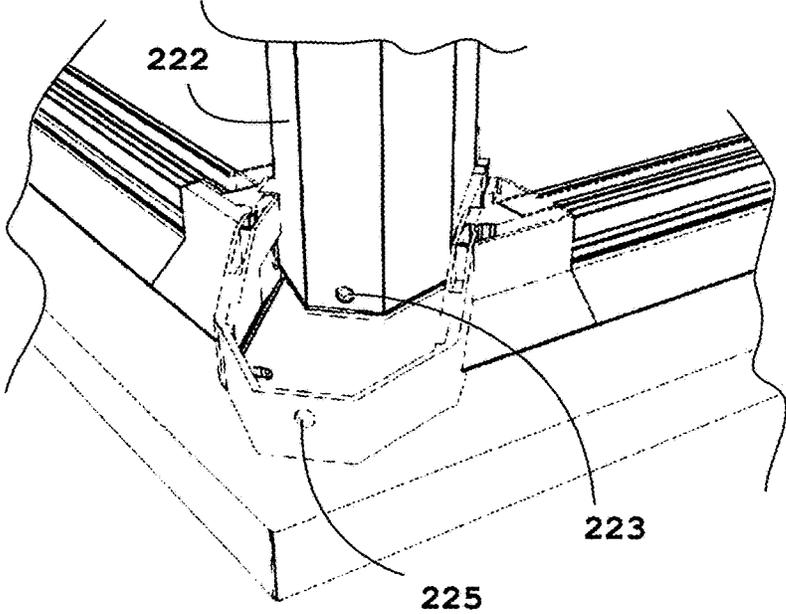


Figure 6B

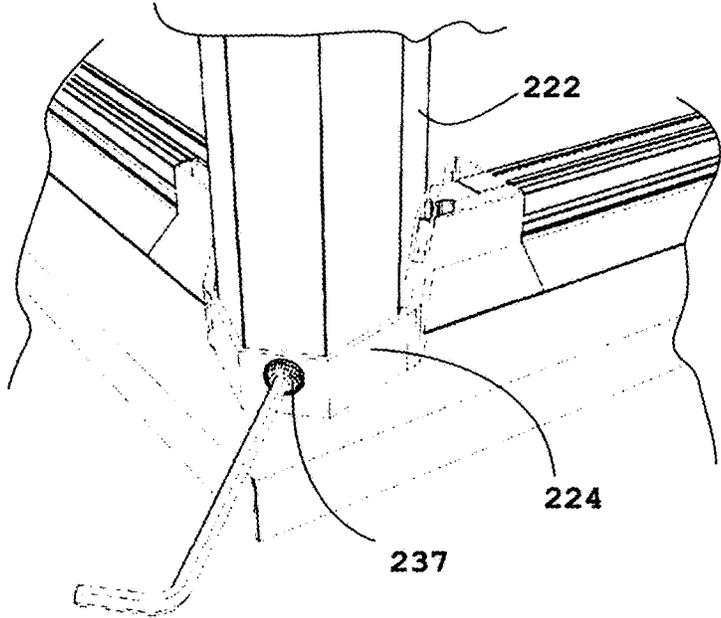


Figure 6C

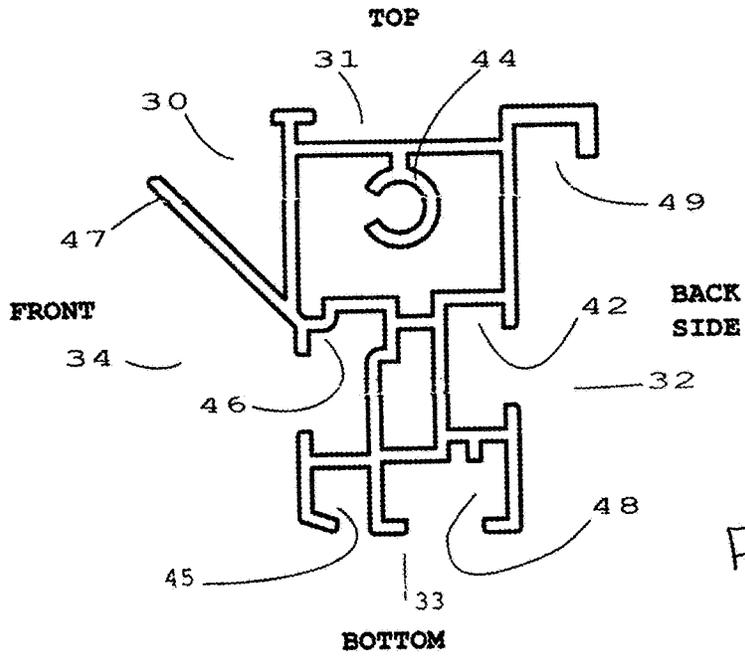


Figure 7A

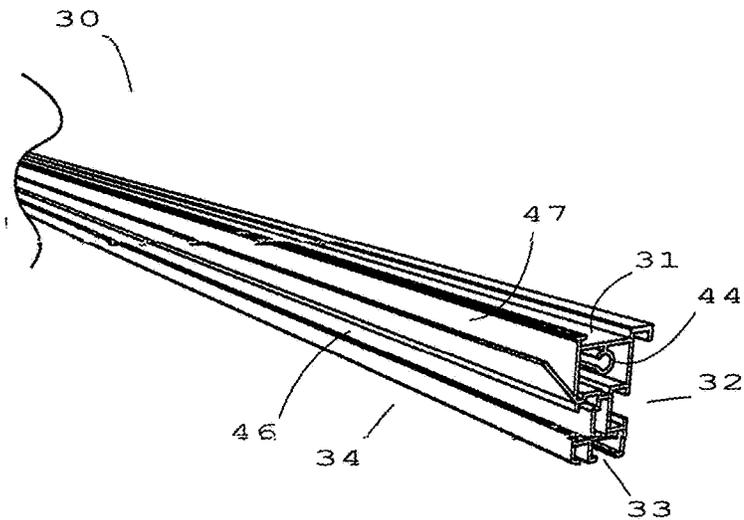


Figure 7B

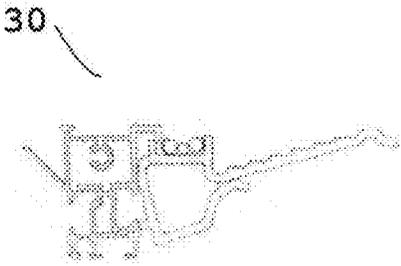


Figure 8A

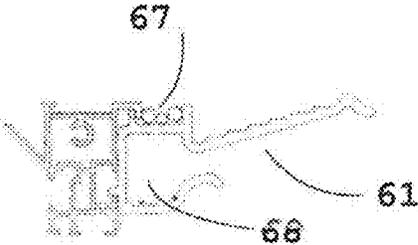


Figure 8B

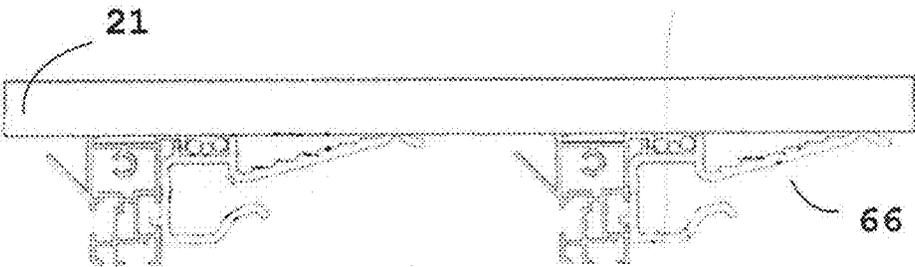


Figure 9A

Figure 9B

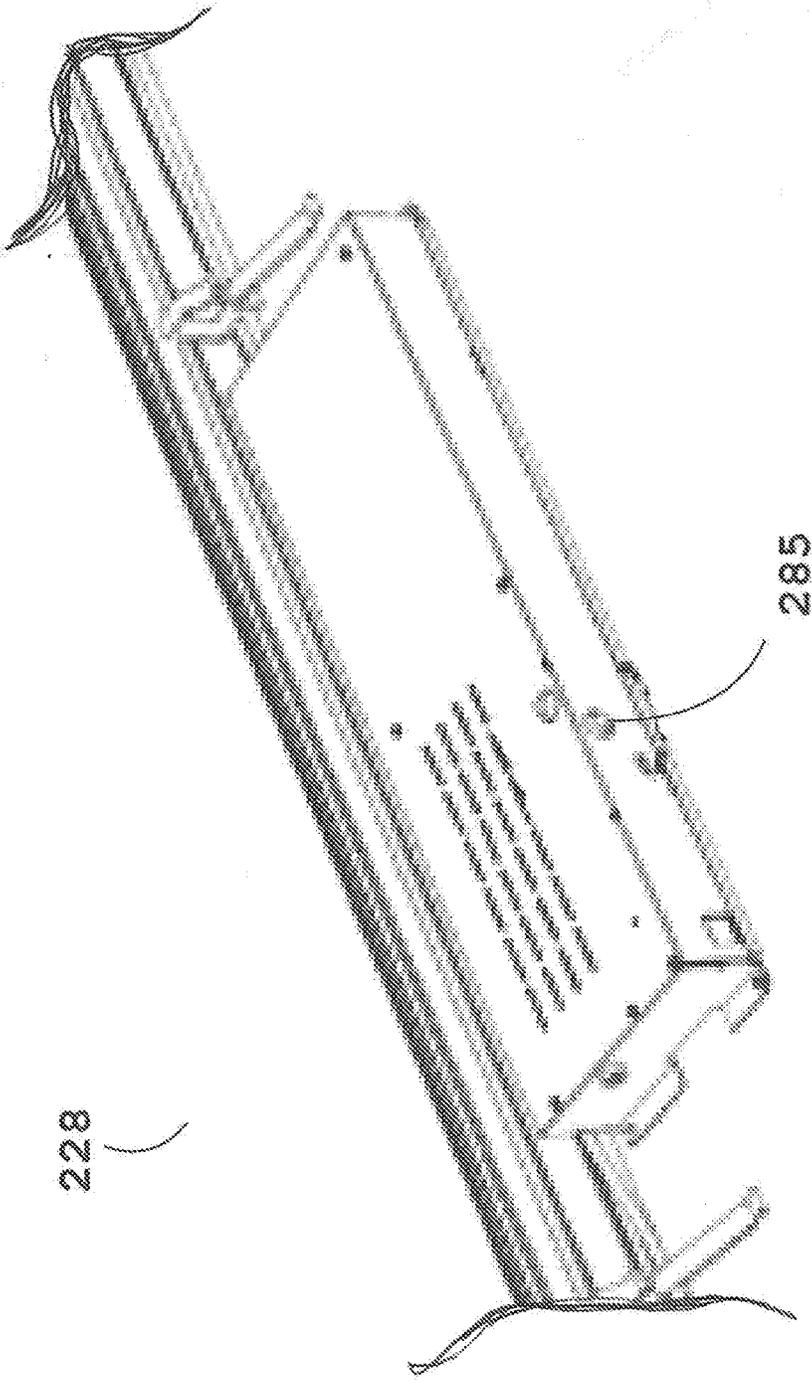


Figure 10

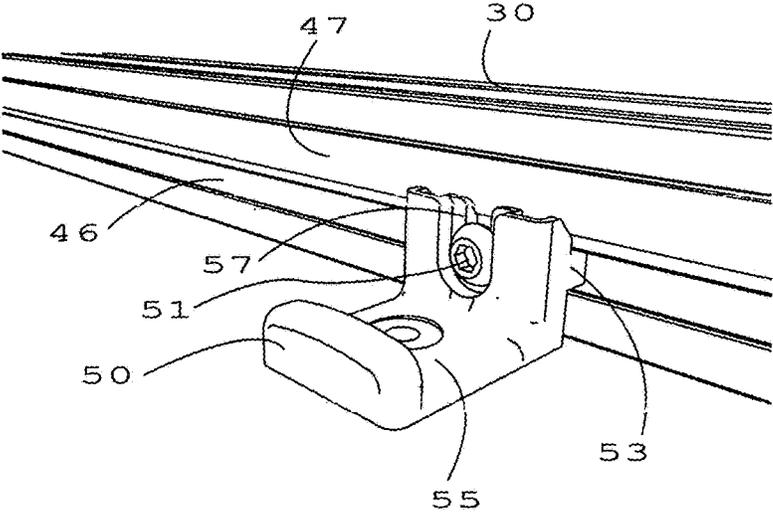


Figure 11A

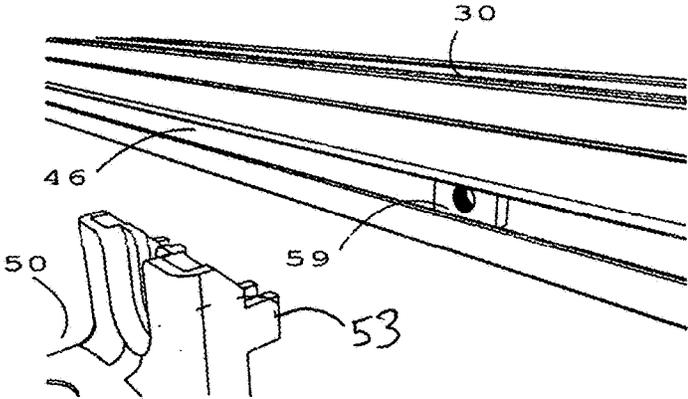


Figure 11B

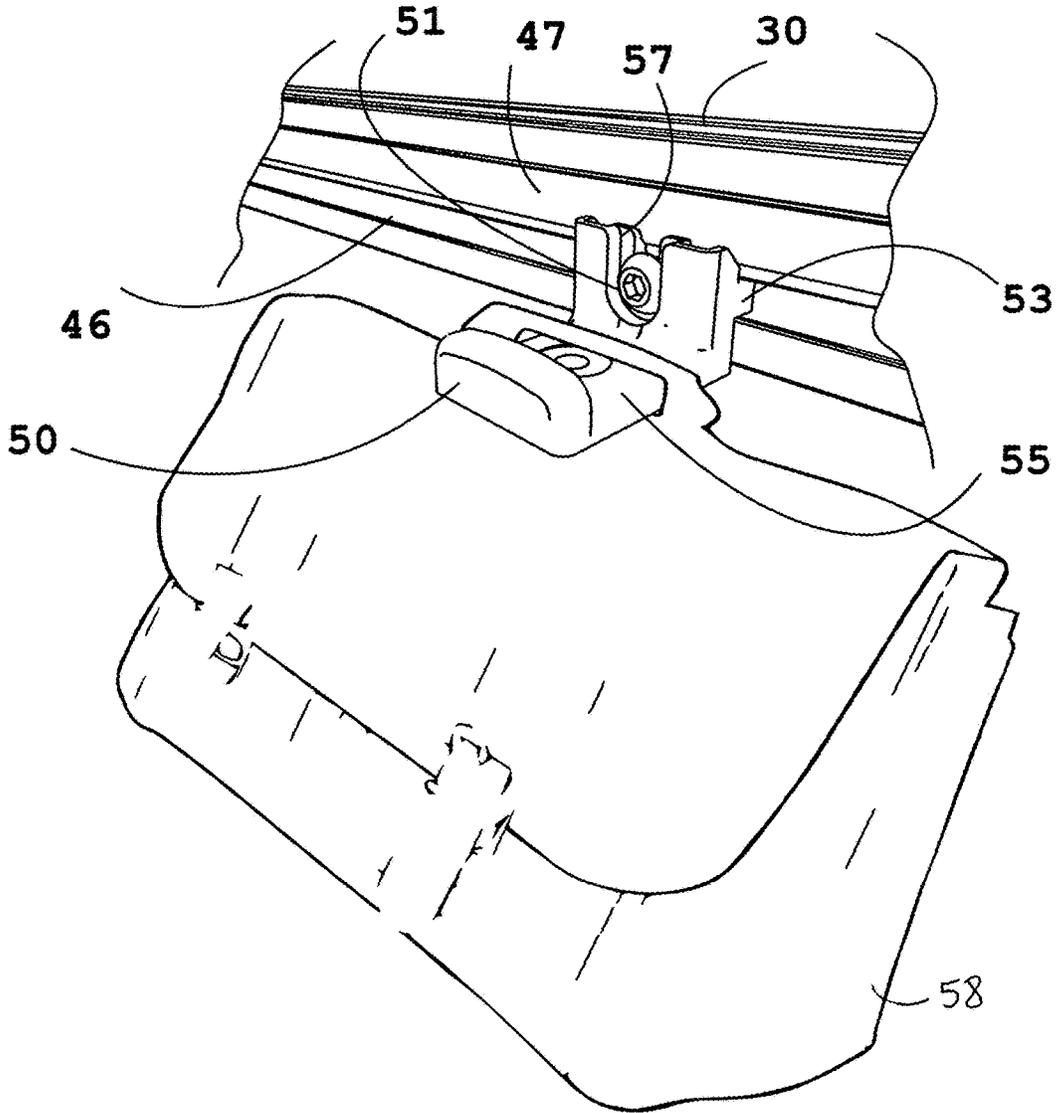


Figure 11C

## ADAPTABLE WORKSTATION

### CROSS REFERENCE TO RELATED APPLICATION(S)

**[0001]** This application claims the benefit of priority under 35 U.S.C. § 119(e) of Chinese Patent Application No. 2016 2 0996963.6, filed Aug. 30, 2016 to Alex Coo, the entire content of which is incorporated herein by reference.

### BACKGROUND OF THE INVENTION

#### Field of the Invention

**[0002]** The present invention generally relates to an improved adaptable workstation and more specifically to more efficient movement of work stations when loaded or unloaded and/or improved storage and utility functions for adaptable work stations including work benches and desk areas.

#### Background Information

**[0003]** Sit stand desks are not new. Even push-button, self-rising desks are not new. First generation sit stand desks leave a lot to be desired. The drawbacks of the current sit-stand type work stations is that there are issues of raising and lowering the stations quietly and/or efficiently when in either a loaded or unloaded state. Additionally, the current sit stand workstations have generally low load limits or are limited in design possibilities for the end user. The present state of sit-stand work stations is very uniform with very little options for the end user in regards to leg placement, cord placement, desk design and storage capabilities.

**[0004]** Unfortunately sit stand work stations, despite their known health benefits, have been slow to be incorporated into the general work population, the reasoning seems to be that users have not been able to find that the increased technology is efficiently applied and customizable for each users end workstation set-up.

**[0005]** The embodiments of the present invention generally include improvements in motor efficiencies and more customizable workstation design options which solve the above described problems. Thus, the embodiments of the present invention provide for an improved adaptable sit stand workstation.

### SUMMARY OF THE INVENTION

**[0006]** The embodiments of the present invention are designed to allow for an individualized approach to a sit-stand work station that has more efficient raising and lowering capabilities and smarter technology, designs and accessories. The embodied workstations are versatile and intelligently designed in either a four-legged (Quattro) design or a two-legged (Duo) design with improved liner actuator motor capabilities to independently control each leg in a more efficient manner. Additionally, customizable options including storage management, cord management, and high-tech assistance options are embodied in the present invention

**[0007]** Further embodiments of the present invention relate to an improved sit stand workstation that includes improved motor coordination of the workstation legs; and additional embodiments which feature more customizable workstation approaches in relation to leg design, storage

options and the incorporation of smart features into the desk which results in a more customizable and efficient workstation set up for the user.

**[0008]** A first embodiment of the present invention related to an improved liner actuator mechanism for placement in the legs of a workstation which allows for more stable raising and lowering mechanism while reducing the number of parts and fail points (such as less chance of falling off track) associated with other related motor mechanisms.

**[0009]** Another embodiment of the present invention relates to utilizing the improved liner actuator in a two legged sit stand workstation design.

**[0010]** Yet another embodiment of the present invention relates to utilizing the improved liner actuator in a four-legged sit stand workstation design.

**[0011]** Additional embodiments relate to advanced track systems for attaching to the embodied workstations to manage and individualize placement of personal items, work equipment or structural features to match a users preference.

**[0012]** Yet additional embodiments relate to the cable management tracking and single bolt attachment design for attaching each of the legs in the four-legged workstation embodiment.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** The principles of the present invention will be apparent with reference to the following drawings, in which like reference numerals denote like components:

**[0014]** FIG. 1 represents a schematic line drawing of an embodied liner actuator component of the present invention.

**[0015]** FIG. 2 depicts a line drawing of an embodied liner actuator when placed in the leg of an embodied sit stand work station

**[0016]** FIG. 3 consists of FIGS. 3A, 3B, and 3C which are line drawings of an embodied two-legged sit work station (shown without a table top) with a cable management tray and support structure wherein FIG. 3A shows a two legged workstation with attached track supports and cable management tray; FIG. 3B shows the same workstation without the attached track supports; and FIG. 3C shows an embodied cable management tray for use with the embodied two-legged workstation.

**[0017]** FIG. 4 depicts a line drawing of an embodied four-legged sit stand work station with an attached table top and track supports.

**[0018]** FIG. 5 depicts a line drawing of the underside of an embodied four-legged sit stand work station of FIG. 4 without the legs attached.

**[0019]** FIG. 6A depicts a line drawing of the embodied four-legged sit stand work station of FIGS. 4 and 5 wherein one of the four legs is being mounted to the work station.

**[0020]** FIG. 6B depicts a line drawing of the embodied four-legged sit stand work station of FIGS. 4, 5 and 6A wherein one of the four legs is being mounted to the work station.

**[0021]** FIG. 6C depicts a line drawing of the embodied four-legged sit stand work station of FIGS. 4, 5, 6A and 6B wherein one of the four legs is mounted and secured to the work station.

**[0022]** FIG. 7A depicts an end view line drawing of an embodied track system capable of mounting to an embodied work station.

**[0023]** FIG. 7B depicts a perspective view line drawing of an embodied track system capable of mounting to an embodied work station.

**[0024]** FIGS. 8A and 8B depicts an end view line drawing of the embodied track system with a further embodied cable clip attachment in the closed position and open position respectively.

**[0025]** FIGS. 9A and 9B depicts an end view line drawing of the embodied track system with the further embodied cable clip attachment depicted in FIGS. 8A and 8B further mounted to the underside surface of an embodied workstation; wherein FIG. 9A represents the track closest to the user and FIG. 9B represents the track distal from the user.

**[0026]** FIG. 10 is a perspective line drawing showing an embodied power box for attachment to the embodied work stations.

**[0027]** FIGS. 11A, 11B and 11C demonstrate perspective line drawings of an embodied hook attachment to the embodied track system; wherein FIG. 11A shows the hook attached to the track; FIG. 11B shows the separate from the track; and FIG. 11C shows the hook attached to the track with a further personal use item hanging from the hook.

#### DETAILED DESCRIPTION OF THE INVENTION

**[0028]** Embodiments of the present invention are based on the desire to make an improved adaptable sit stand workstation. The embodied invention achieves this through integrating a plurality of features selected from a better motor liner actuator design, for two legged or four legged workstations; customizable storage management and accessory management features; and/or smart technologies for more efficiently managing either the workstation, the user, and or the users equipment and personal items.

#### Improved Motor Embodiments

**[0029]** Embodiments of the present invention relate to an improved motor system comprising a new type of motor and decelerator structure design of a liner actuator further including a floating motor assembly/decelerator without a frame.

**[0030]** The Liner Actuator (linear driver, lifting column, etc.) is an extension of the structure of the rotating motor. It is an electric drive that converts the rotational motion of the motor into a straight reciprocating motion of the push rod. The embodied Liner Actuator can be used in a variety of simple or complex processes as the implementation of mechanical use, in order to achieve long-range control, centralized control or automatic control. Can achieve long-range centralized or automatic control. The liner actuator comprises a drive motor, reduction gear, screw, nut, guide sleeve, putter, slide, spring, shell and turbine, micro control switch and other components.

**[0031]** At present, in order to ensure efficiency, the motors and speed decelerators of the prior art need high-precision fixed installation to ensure concentricity, thus, the decelerator also needs a high-precision frame to ensure the operation of the concentricity. When the operation of the concentricity fails the unit falls off track or high degrees of wobble or is unable to move efficiently when loaded. Furthermore the disadvantages of this fixed high precision from design is: 1) space occupied, the entire liner actuator's trip is limited; 2)

Expensive, the complexity structure and high precision assembly requirement means a higher cost of the components and assembly.

**[0032]** The embodied new type of motor and decelerator design for liner actuator, is designed to be a Floating Motor Assembly and a No Frame Decelerator Assembly. The floating motor assembly comprises a motor base, an elastic parts and fastener, The No Frame Decelerator assembly comprises a sun gear, planetary gear and outer ring driving gear wheel.

**[0033]** There is an elastic parts (spring or other resilient part) between the motor and the fastener fixed to the motor base, in the process of running in a limited floating state, the motor shaft drives the sun gear, the sun gear drives the planetary gear, the planetary gear drives the Ring drive gear wheel, ring drive gear wheel directly or through the coupling indirect drives the screw mechanism.

**[0034]** Due to the use of the floating structure, the entire drive and Decelerator need not maintain a tight centimeter structure, and a fixed frame can be omitted. The entire drive mechanism can be automatic and maintains the concentricity itself during the operation. The core of this design is to use a more simple structure to solve the concentricity, it additionally maximizes the motor's driving force, and reduces the efficiency loss and vibration by the normal high rigidity transmission mechanism design. Additionally, the embodied liner actuators self-adaptation feature can effectively eliminate problems caused by external structures and parts defect, like poor screw straightness, external structure offset etc.

**[0035]** Some of the advantages of the embodied liner actuators are that they greatly reduce the mechanism space at the direction of the linear drive, which improves the effective working stroke, as compared with other designs using a similar motor and gear-reduction ratio but a fixed frame assembly.

**[0036]** Second, the present embodiments reduce the complexity of the lifting mechanism, by reducing the manufacturing difficulty and cost. As the decelerator mechanism no longer requires a fixed frame, the assembly complexity is greatly reduced, the manufacturing difficulty is greatly reduced, and the number of parts and parts processing accuracy requirements is greatly reduced.

**[0037]** An embodied liner actuator mechanism 00 is depicted in FIG. 1 wherein FIG. 1 is a schematic diagram of this new type of motor and decelerator design of the embodied Liner actuator 00. As label indicated: 1, screw; 2, bearing; 3, coupling; 4, outer ring driving gear wheel; 5, planetary gear; 6, shock absorber washer; 7, planetary gear carrier; 8, motor; 9, fastener; 10, compression spring or other elastic parts; 11, sun gear; 12, Motor support; 13, coupling elastomer.

**[0038]** The motor floating support structure 00 is mainly completed by the Coupling Elastomer 13 and the shock absorbing washer 6 and the compression spring 10; The driving structure is composed of the outer ring driving gear wheel 4, the planetary gear 5, the planetary gear carrier 7, the motor 8 and the sun gear 11, the screw 1 and the bearing 2.

**[0039]** During the liner actuator's operation, at the push rod working direction, if the eccentricity happens (caused by assembly, or screw 1 poor straightness, or by the external structure offset), the partial load force from the eccentricity can cause the motor to slightly move within the floating fixing mechanism, and maintain the mechanism in a centralized position. It is a form of a self-correcting mechanism.

[0040] In the embodied structure, the material, size and shape of all components can be adjusted as needed. For example the fastener 9, the compression spring 10 can be replaced by other structural components or processes, such as replacing the compression spring 10 with other similar elastomers, or replacing the fastener 9 with pins or other fixed parts, which can achieve the same floating motor fixing structure.

[0041] The screw 1 and the bearing 2 and the motor support 12 constitute a push mechanism which is a universal screw drive-type mechanism, which can be used in virtually any other screw drive type structure as well.

[0042] In the present embodiments the liner actuator is used in workstation legs to raise and lower the station.

[0043] As shown in FIG. 2 an embodied liner actuator 00 is placed in the leg 22 of an embodied sit stand work station (not shown). The screw 1 and sun gear 11 of the liner actuator 00 are shown in the column of the leg. The liner actuator engages the height adjustable desk column. The column is may be about 680 MM in the shortest length, with only one screw lever inside required inside but can achieve about a 520 MM straight line travel to reach 1200 MM at its longest length, and does not require a frame structure for the decelerator to be secured to within the leg.

#### Two and Four Legged Workstation Embodiments

[0044] The embodied two-legged workstations are demonstrated in FIGS. 3A-3C.

[0045] FIG. 3 consists of FIGS. 3A, 3B, and 3C which are line drawings of an embodied two-legged sit-stand workstation 300 (shown without a table/workstation top 21). FIGS. 3A and 3B demonstrate an embodied two-legged workstation 300 comprising flat floor supports 321 attached to movable up/down legs 322 which comprise an embodied liner actuator 00 (not shown) within the legs 322. Additional angle support stabilizer legs 323 attach to the legs 322 and the flat floor support 321 to further stabilize the workstation and avoid imbalance or tipping at higher workstation positions. Additionally, a stabilizer cross support 324 is attached to each angle support stabilizer leg 323 to provide greater lateral stability. At the top of the legs 322 is a dual purpose cable management and support tray 325 which may further house the power box 328 which controls the cables (not shown) in and out of the legs 322 to raise and lower the workstation. Additionally, workstation top supports 336 attach to the upper legs 322 and the cable management and support tray 325, when a workstation top (not shown) is secured to the workstation 300 it is supported on the workstation top supports 336 and the cable management support tray 325. The workstation supports also will accept a bag/personal item hook 350 which is secured to the top support 336.

[0046] FIG. 3A additionally introduces a versatile track support structure 330 that acts as a workstation top support, a leg stabilizer and a personal item management device. FIG. 3C shows some of the advanced features associated with the cable management support tray 325. The tray 325 attaches to the workstation legs through attachment hole 338. Additionally, cable management holes 337 enable space for cables to secure to the power box 328 when mounted in position within the support tray 325. The cable management holes 337 allow the user to manage cables by running them the length of the desk. Optionally a user can use accessory

screws and nuts to fix personal items to the tray 325 through the cable management holes 337.

[0047] The two-legged adjustable workstation 300 has two electronic motors 00 (not shown) within each leg 322 and a desktop 321, a duo frame, a main power box 328, and a control panel 273.

[0048] The embodied four-legged workstations are demonstrated in FIGS. 4, 5 and 6A-6C.

[0049] As shown in the four-legged workstation 200 of FIG. 4 a table/workstation top 221 is shown secured to raising and lowering legs 222 and attached via a specialized single bolt 224 leg attachment system. Each of the four legs 222 comprise an embodied liner actuator 00 (not shown) within the legs 222 that are stopped and started with a control panel 226 which is secured at the front of the workstation to control various desk operations in addition to the raising and lowering of the workstation. Additionally, the power box 228 is secured at the backside of the work station and coordinates and synchronizes the movement of the cables within each leg 222 so that when used in conjunction with the embodied liner actuator the desk raises and lowers smoothly, and quietly whether loaded or unloaded. Additionally, a versatile track support structure 230 that acts as a workstation top support, a leg stabilizer and a personal item management device is shown.

[0050] FIG. 5 depicts a line drawing of the underside of an embodied four-legged sit stand workstation wherein a table/workstation top 221 is shown with a control panel 226 which is secured at the front of the workstation to control various desk operations in addition to the raising and lowering of the workstation. Additionally, the power box 228 is secured at the backside of the work station and coordinates and synchronizes the movement of the cables within each leg 222 so that when used in conjunction with the embodied liner actuator the desk raises and lowers smoothly, and quietly whether loaded or unloaded. Additionally, a versatile track support structure 230 that acts as a workstation top support, a leg stabilizer and a personal item management device is shown. Additionally, the varying length leg cables 261, 262 and 263 are shown run from the power box to their individual legs controlled. A fourth cable line for the fourth leg is not shown.

[0051] FIGS. 6A through 6C demonstrate the progression of fixing a leg 222 to the single bolt attachment mechanism 224 wherein FIGS. 6A-6C shows the workstation top 221 with the attached single bolt leg affixation system 224 attached to the work station top 221, leg 222 has a male protrusion 227 on both sides of the leg 222 which mate with a female slot 229 on each side of the affixation system 224. A single bolt not 237 extends through hole 225 on the affixation system 224 into screw hole 223 on the leg 222 and is secured FIG. 6A depicts a line drawing of the embodied four-legged sit stand work station of FIGS. 4 and 5 wherein one of the four legs is being mounted to the work station.

#### Track System Embodiments

[0052] The adaptable desk storage track system 30 allows the user to connect all sorts of accessories to their desk, such as the cable management clips or other clips and accessories that may be customized to end user and attached directly to the desk. Some embodied accessories include privacy shields, CPU holders, monitor arms, bag hooks, privacy curtains on theirs. The track system enables the user to make their desk a DIY project if they want.

**[0053]** FIGS. 7A and 7B depicts an end view line drawing and perspective view drawing of an embodied track system **30** capable of mounting to an embodied workstation. The tracking system comprises a top portion **31** which attaches to the underside of a workstation, a back side **32** which is distal from the user a bottom side **33** which faces the floor and a front side **34** which faces the user. On the back side **32** there is a central opening **42** which allows for various clips or attachments to be placed. Additionally, there is a back side flange **49** which attaches to the underside of the workstation. The bottom side **43** includes a proximal **45** and a distal opening which again each allow for clips cables or other items to be secured. The front side **34** includes an angled flange **47** which allows various items to hang or secure from, and a central recess **46** which further includes the ability to hold a nut locking mechanism **59** (shown in FIG. 11B). Additionally an internal half tube **44** is available within the track system to run wires or cables.

**[0054]** FIGS. 8A and 8B depicts an end view line drawing of the embodied track system **30** with a further embodied cable clip attachment **61** which secures to the back side of **32** of the tracking system **30** and includes a top cable management recess **67** and a central cable management recess **68** that can be opened and closed.

**[0055]** FIGS. 9A and 9B depicts an end view line drawing of the embodied track system **30** with the further embodied cable clip attachment **61** depicted in FIGS. 8A and 8B further mounted to the underside surface of an embodied workstation; wherein FIG. 9A represents the track closest to the user and FIG. 9B represents the track distal from the user and additionally where both Figures show extended cable arm **66** which creates another area for cable management but also serves as a lever to open the clip **61** for placing cables and wires.

**[0056]** As shown in FIG. 10 is a perspective line drawing showing an embodied power box **228** for attachment to the embodied workstation which includes a specialized whisper mode function button **285** which enables the user to set the actuator **00** in a slower quiet mode (sort of like a lower more controlled gear). The embodied power box may also include smart control features such as desk controls which control the motors, turns on the lights when you approach, allow for voice command features and speaker phone technologies; Alexa or Siri type features. DragonSpeak type dictation or other hands free command features and is adaptable to current and future apps. Other features may include Wifi or

blue tooth communication enabled and cordless recharging. As the brains of the desk operation the smart controller not only ensures the desk will stay level after thousands of position changes, embodiments may include built in motion sensors that determine when the user is at their desk, turning on the LED lights and reminding the user when it's time to change positions and contain a feature which recognizes a user and remembers the users preferred desk positions.

**[0057]** Additional operational components include but are not limited by the following:

**[0058]** Control Panel: the control panel is used to raise and lower the desk and has two buttons. The button on the left lowers the desk and the right raises the desk. Pressing and holding a button raises and lowers the desk. It will stop when the button is released.

**[0059]** Setting Memorized Positions: The control panel allows the user to memorize two positions so the user can easily raise and lower their desk to pre-set positions with one push of a button. To memorize a position, set the desk at the lower position that is ideas for the user while sitting. Then press both buttons until the light blinks once. Release the button. The sitting position memory is recorded.

**[0060]** Next raise the desk to the high position that is comfortable when the user is standing. The press both buttons until the light blinks once. Release the button. The standing position memory is recorded.

**[0061]** Although the invention has been described with reference to the above examples, it will be understood that modifications and variations are encompassed within the spirit and scope of the invention. Accordingly, the invention is limited only by the following claims.

What is claimed is:

1. A movable workstation comprising:

A top workspace area; a movable base consisting of two or four legs; wherein each movable leg includes a liner actuator mechanism and a power box;

Wherein the powerbox controls the movement of the liner actuator mechanisms which further control the movement of the legs; such that the work station can be raised and lowered on command.

2. The movable workstation of claim 1 further comprising an attached track system to a bottom surface of a top workspace area; wherein the track system enables management of cords and personal items.

\* \* \* \* \*