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(54) **PORTABLE AND ADJUSTABLE DESK**

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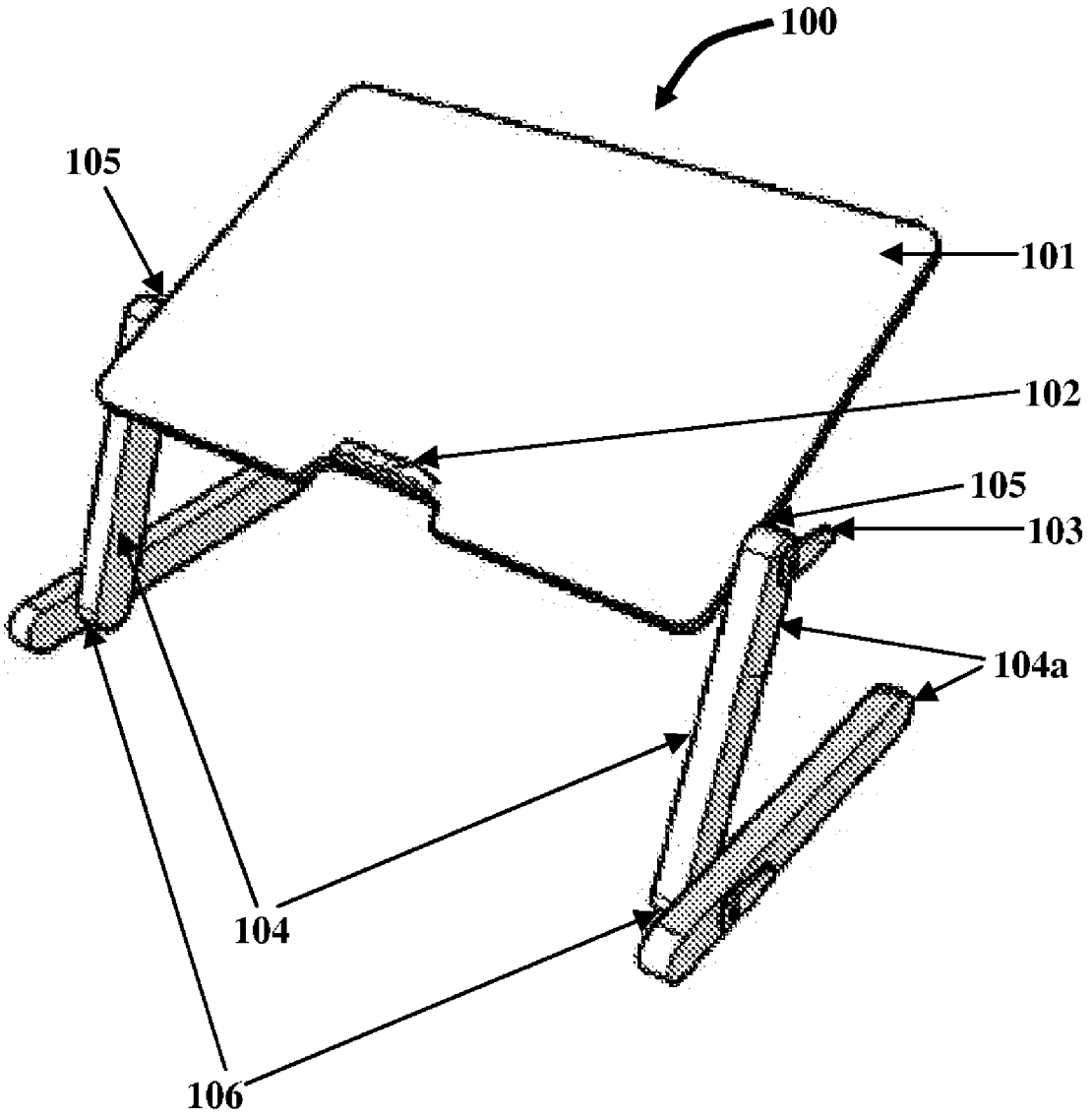
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(57) **ABSTRACT**

Disclosed herein is a portable, adjustable, and foldable desk for using laptop computers or reading books in bed. The apparatus comprises a flat upper panel attached to leg assemblies at first lockable joints, and joint locks. The flat upper panel is freely rotatable about the first lockable joints on unlocking the first lockable joints for adjusting angle of the flat upper panel. Each of the leg assemblies comprises leg segments interconnected at second lockable joints. The leg segments are freely rotatable about the second lockable joints on unlocking the second lockable joints for adjusting height of the leg assemblies. The joint locks lock the first lockable joints and the second lockable joints. Each joint lock comprises a first friction plate, a second friction plate, a washer, and a locking button. The locking button locks the first friction plate, the second friction plate, and the washer using a pushing force.



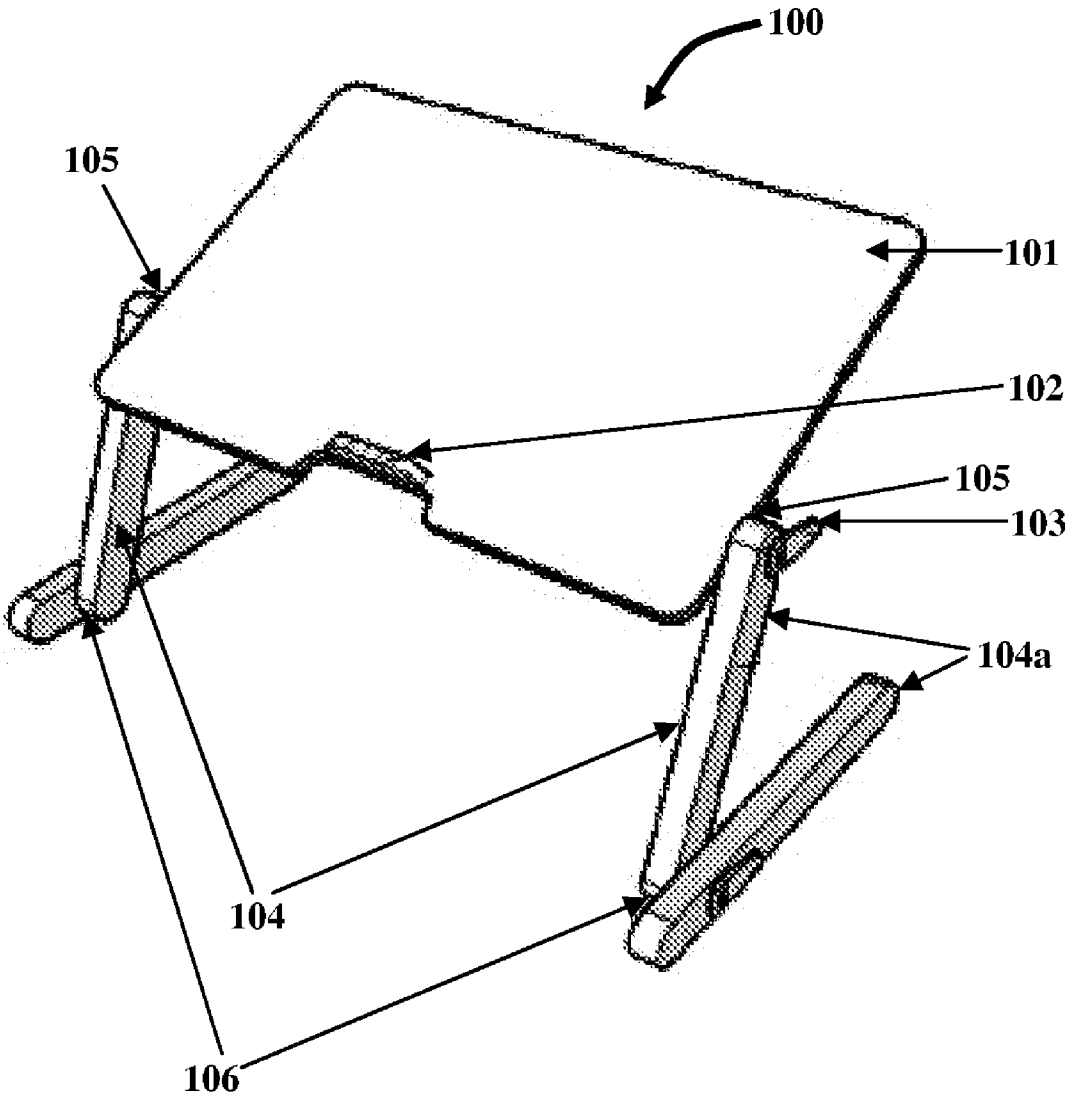


FIG. 1

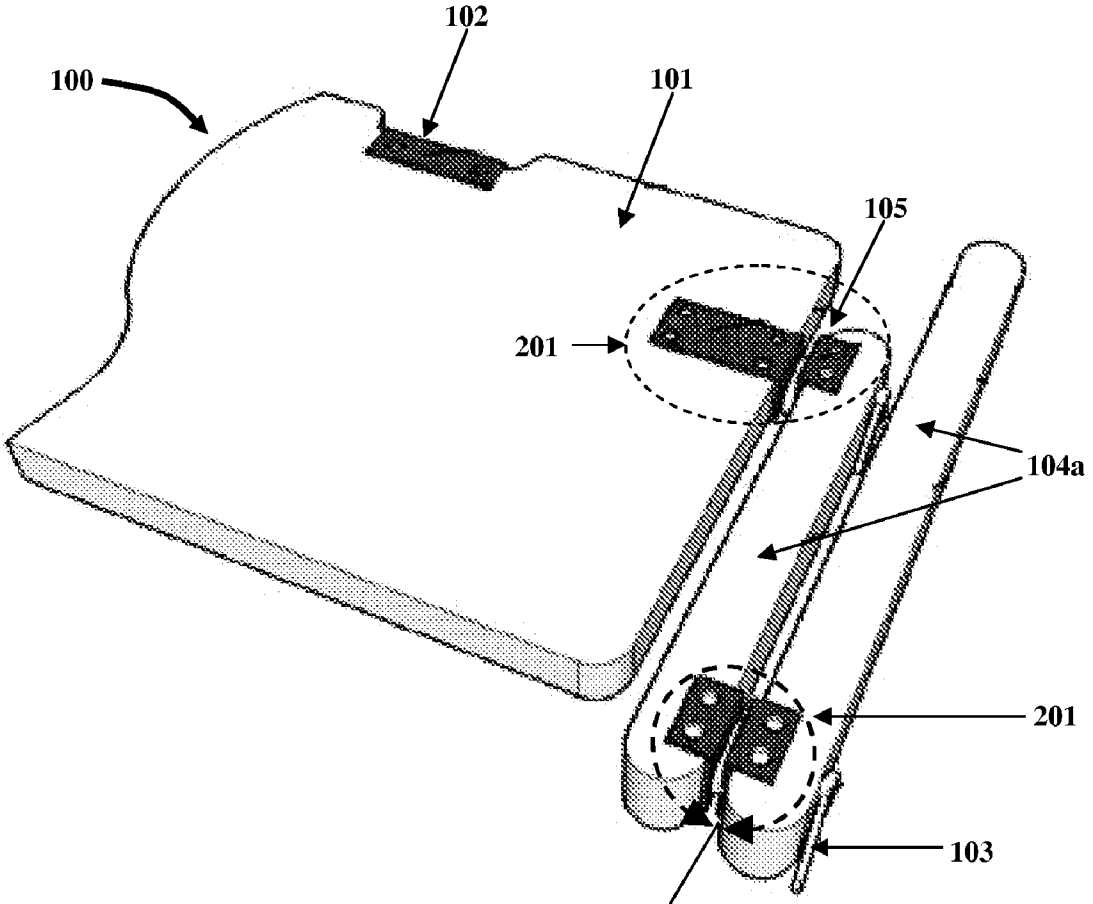


FIG. 2

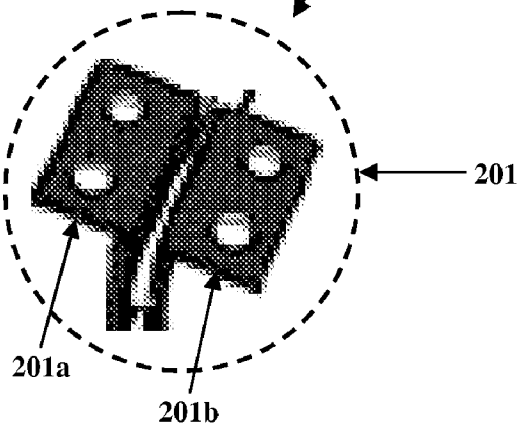


FIG. 3

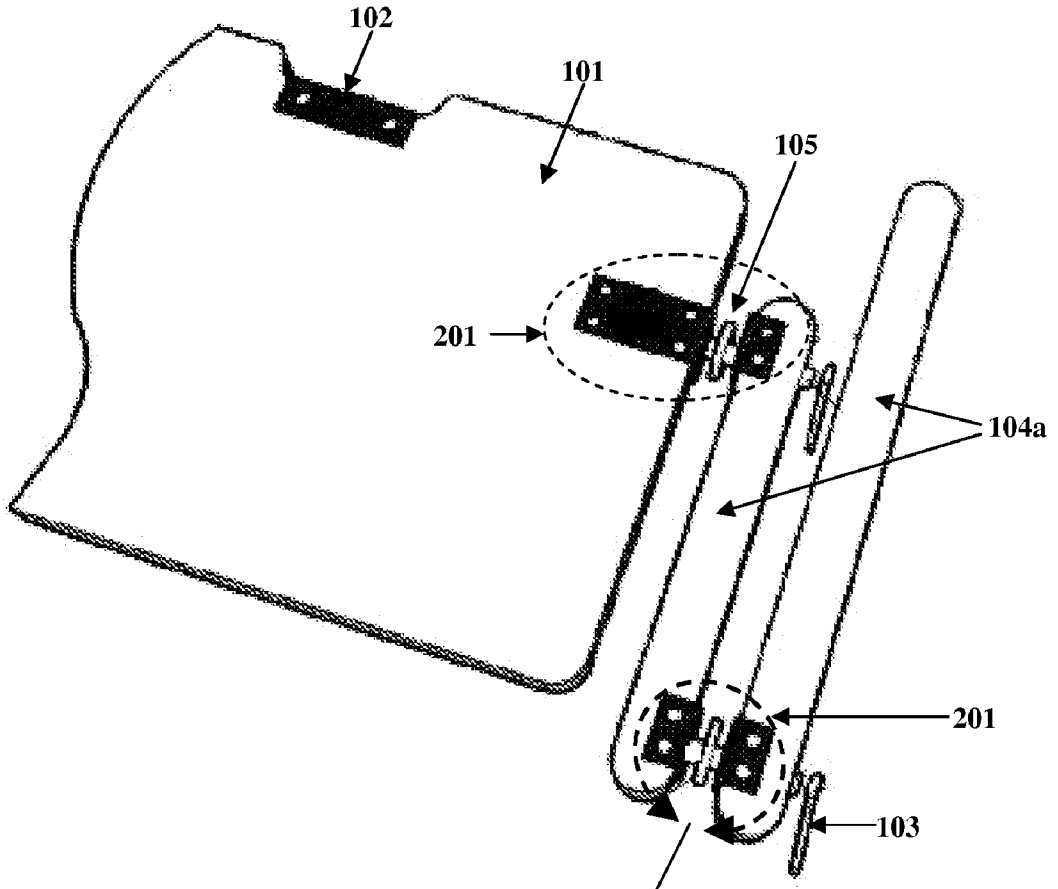


FIG. 4

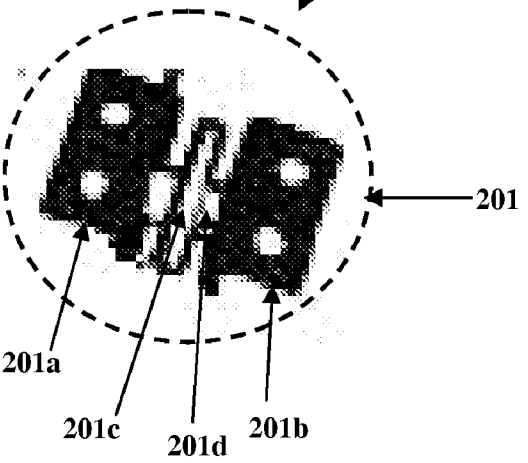


FIG.5

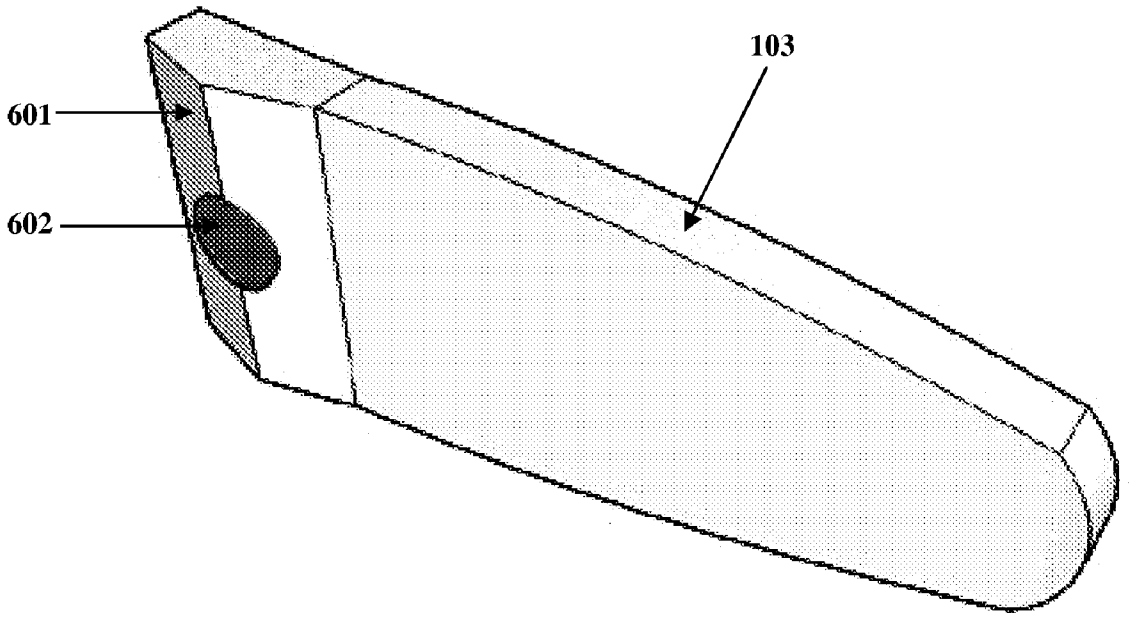


FIG. 6

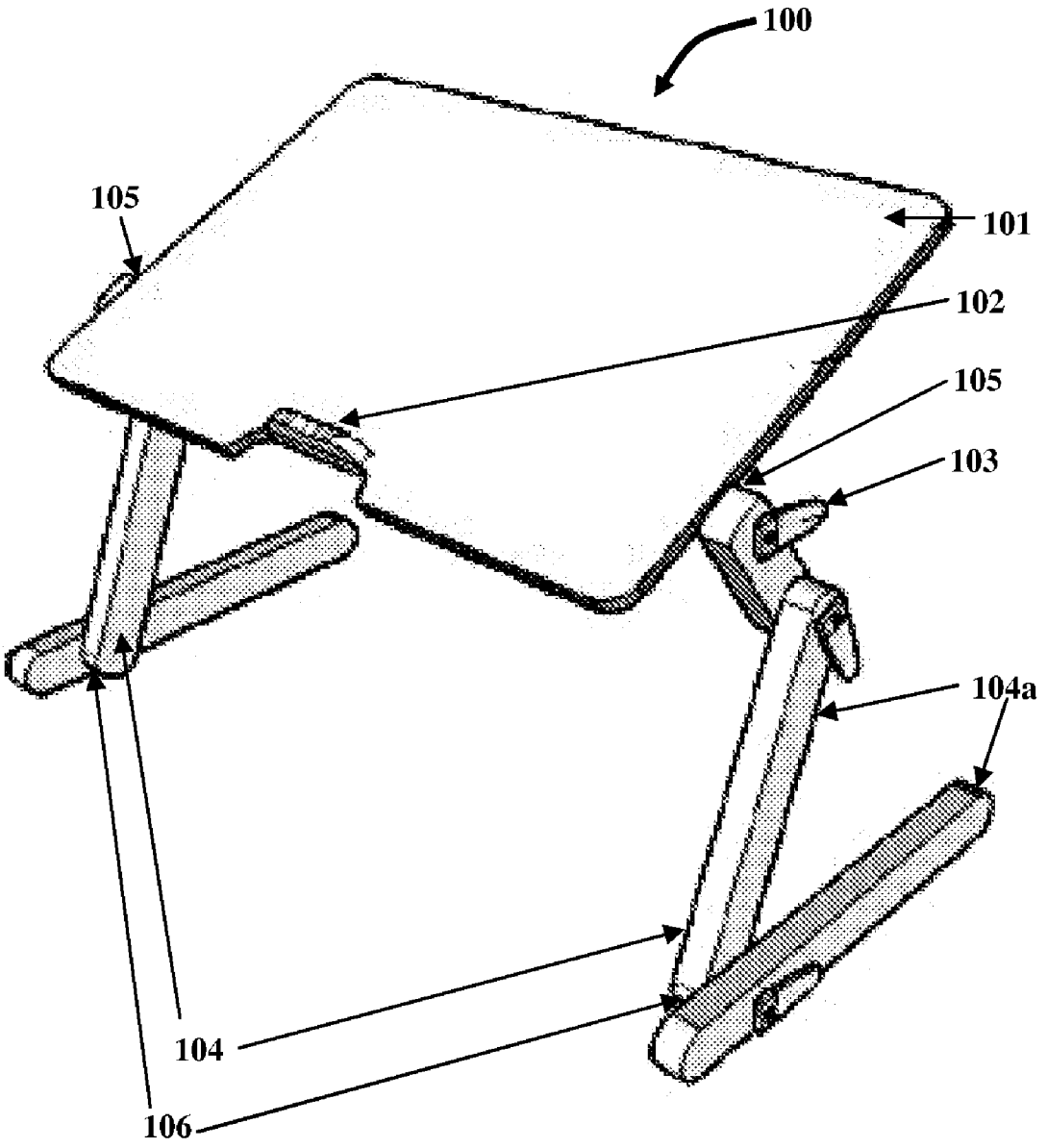


FIG. 7

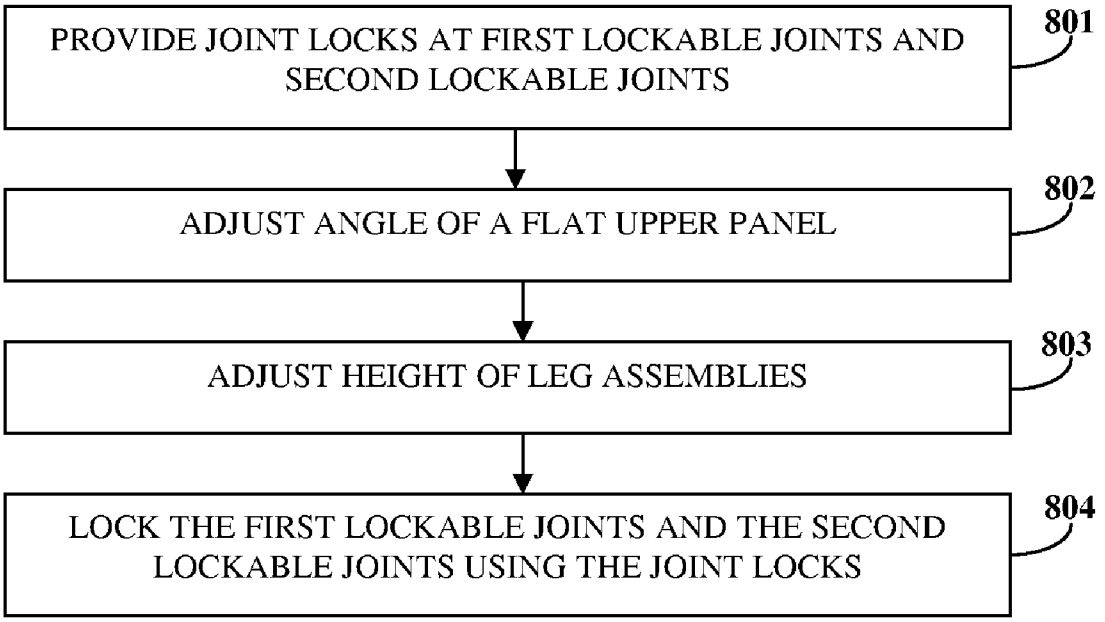

PROVIDE JOINT LOCKS AT FIRST LOCKABLE JOINTS AND SECOND LOCKABLE JOINTS
801
ADJUST ANGLE OF A FLAT UPPER PANEL
802
ADJUST HEIGHT OF LEG ASSEMBLIES
803
LOCK THE FIRST LOCKABLE JOINTS AND THE SECOND LOCKABLE JOINTS USING THE JOINT LOCKS
804

FIG. 8

PORTABLE AND ADJUSTABLE DESK

BACKGROUND

[0001] This invention, in general, relates to foldable furniture. More specifically, this invention relates to a portable apparatus for providing an adjustable activity surface.

[0002] People often check emails using a laptop computer, or read a book in bed shortly before sleeping or soon after waking up. Typically the laptop computer or the book is positioned on the user's lap. The user needs to make an effort to balance the laptop computer or the book or view the screen of the laptop computer from a proper viewing angle, which often causes discomfort, for example, fatigue and pain of the hands, wrists, arms, neck, and legs.

[0003] Different desks or support devices are used in an attempt to alleviate these discomforts. Some support devices may use non-skid rubber material on the top surface to grip the laptop computer. A computer desk may be supported on web strapping that passes over the legs of a seated user. However, the height of the computer desk is generally not adjustable and any movement of the legs of the user might cause the laptop computer to slide to an undesirable position.

[0004] Portable and adjustable tables may comprise a table surface and foldable legs. When in use, the legs may be adjusted to vary the height of the table surface, and a table adjustment mechanism may be used to adjust the table surface. However, adjusting the height and the angle are complicated and take time. Furthermore, there is no provision for the user to rest their wrist on the table surface.

[0005] Hence, there is a need for a portable apparatus for providing an easily adjustable activity surface while ensuring user comfort.

SUMMARY OF THE INVENTION

[0006] This summary is provided to introduce a selection of concepts in a simplified form that are further described in the detailed description of the invention. This summary is not intended to identify key or essential inventive concepts of the claimed subject matter, nor is it intended for determining the scope of the claimed subject matter.

[0007] The portable apparatus disclosed, herein referred to as an "adjustable desk" addresses the above stated need for providing an adjustable activity surface. The adjustable desk comprises a flat upper panel and multiple joint locks. The flat upper panel is attached to multiple leg assemblies at multiple first lockable joints. The flat upper panel is freely rotatable about the first lockable joints when the first lockable joints are unlocked for adjusting angle of the flat upper panel. Each of the leg assemblies comprises multiple leg segments interconnected at multiple second lockable joints. The first lockable joints and the second lockable joints together are herein referred to as "lockable joints". The leg segments are freely rotatable about the second lockable joints when the second lockable joints are unlocked for adjusting the height of the leg assemblies. The joint locks lock the first lockable joints and the second lockable joints. Each of the joint locks comprises a first friction plate, a second friction plate, a washer, and a locking button.

[0008] The first friction plate comprises an elongate shaft extending outward from the first friction plate. The second friction plate comprises an opening for passing the elongate shaft. The washer is sandwiched between the first friction plate and the second friction plate. The washer comprises an opening for passing the elongate shaft. The washer prevents relative motion between the first friction plate and the second friction plate.

[0009] The locking button locks the first friction plate, the second friction plate, and the washer together by exerting a pushing force along the elongate shaft. The locking button comprises a socket for housing the elongate shaft. The locking button may be pushed toward the first friction plate and the second friction plate along the elongate shaft to lock the lockable joints. The locking button may be pulled away from the first friction plate and the second friction plate along the elongate shaft to unlock the locked lockable joints.

[0010] The flat upper panel may comprise an elevated portion for preventing sliding of an article, for example, a book, a newspaper, or a laptop computer, placed on the flat upper panel. The flat upper panel may further comprise multiple wrist supports on either side of the elevated portion. The adjustable desk may further comprise a restraint band attached to the flat upper panel for restraining an article to the flat upper panel. The flat upper panel may further comprise multiple exhaust fans for dissipating heat generated by an article, for example, by a laptop computer placed on the flat upper panel. The flat upper panel may further comprise multiple integrated universal serial bus hubs. The flat upper panel may comprise a receptacle for holding articles, for example, pens, cups, etc.

[0011] The free rotation about the first lockable joints and the second lockable joints enables adjustment of angle of the flat upper panel and height of the leg segments respectively for the adjustable activity surface.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The foregoing summary, as well as the following detailed description of the invention, is better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, exemplary constructions of the invention are shown in the drawings. However, the invention is not limited to the specific methods and instrumentalities disclosed herein.

[0013] FIG. **1** is a perspective view of a portable apparatus for providing an adjustable activity surface.

[0014] FIG. **2** exemplarily illustrates a bottom view of the portable apparatus with the joint locks used to lock the lockable joints.

[0015] FIG. **3** exemplarily illustrates detail of the joint locks used to lock the lockable joints.

[0016] FIG. **4** exemplarily illustrates a bottom view of the portable apparatus with components of the joint locks used to lock the lockable joints.

[0017] FIG. **5** exemplarily illustrates detail of the components of the joint locks used to lock the lockable joints.

[0018] FIG. **6** exemplarily illustrates a perspective view of a locking button.

[0019] FIG. **7** exemplarily illustrates a perspective view of the portable apparatus wherein each of the leg assemblies comprises three leg segments.

[0020] FIG. **8** illustrates a method of using multiple joint locks for adjusting angle and height of an activity surface.

DETAILED DESCRIPTION OF THE INVENTION

[0021] FIG. **1** is a perspective view of a portable apparatus **100** for providing an adjustable activity surface. The portable apparatus **100** is herein referred to as an "adjustable desk".

The adjustable desk **100** comprises a flat upper panel **101** and multiple joint locks **201**. The flat upper panel **101** is attached to multiple leg assemblies **104** at multiple first lockable joints **105**. The flat upper panel **101** provides an activity surface to a user. The user may perform different activities on the activity surface of the adjustable desk **100**, for example, using a laptop computer, reading a book, writing in a notepad, placing a bowl of food, etc. The flat upper panel **101** is freely rotatable about the first lockable joints **105** when the first lockable joints **105** are unlocked. A user may unlock the first lockable joints **105** to adjust the angle of the flat upper panel **101**. The user may lock the first lockable joints **105** after the adjustment of the angle of the flat upper panel **101**. The user may, for example, adjust the angle of the flat upper panel **101** to obtain an optimum viewing angle of an article placed on the flat upper panel **101**. The user may also adjust the angle of the flat upper panel **101** for using the adjustable desk **100** to support a bowl of food or a cup of a drink. The user may further adjust the angle of the flat upper panel **101** to obtain an optimal reading or writing surface, for example, for reading a book or a newspaper, or writing in a notepad. By adjusting the angle of the flat upper panel **101**, the user may adjust angle of the activity surface.

[0022] The flat upper panel **101** may further comprise an elevated portion **102** for preventing sliding of an article, for example, a book, a newspaper, or a laptop computer, placed on the flat upper panel **101**. The elevated portion **102** may be obtained by attaching a separate entity, for example a piece of wood, to the flat upper panel **101**. The flat upper panel **101** may further comprise multiple wrist supports on either side of the elevated portion **102**. The wrist supports may be padded for providing comfort to the user. The flat upper panel **101** may further comprise a receptacle for holding articles, for example, pens, cups, etc. The adjustable desk **100** may further comprise a restraint band attached to the flat upper panel **101** for restraining an article, to the flat upper panel **101**. The adjustable desk **100** may further comprise multiple exhaust fans for dissipating heat generated, for example, by a laptop computer. The adjustable desk **100** may further comprise multiple integrated universal serial bus (USB) hubs.

[0023] Each of the leg assemblies **104** comprises multiple leg segments **104***a* interconnected at multiple second lockable joints **106**. The first lockable joints **105** and the second lockable joints **106** together are herein referred to as "lockable joints". The leg segments **104***a* are freely rotatable about the second lockable joints **106** when the second lockable joints **106** are unlocked. The user may unlock the second lockable joints **106** to adjust height of the leg assemblies **104**. The user may lock the second lockable joints **106** after the adjustment of the height of the leg assemblies **104**. The user may raise or lower the height of the leg assemblies **104**. The adjustment of the height of the leg assemblies **104** results in adjustment of height of the adjustable desk **100**, thereby adjusting height of the activity surface. The height of each of the leg assemblies **104** may be adjusted separately. Hence, each of the leg assemblies **104** may be adjusted to a different height. The user may adjust each of the leg assemblies **104** to a different height for using the adjustable desk **100** on uneven surfaces.

[0024] FIG. **2** exemplarily illustrates a bottom view of the adjustable desk **100** with the joint locks **201** used to lock the lockable joints **105** and **106**. The joint locks **201** lock the lockable joints **105** and **106**. Each of the joint locks **201** comprises a first friction plate **201***a*, a second friction plate **201***b*, a washer **201***c*, and a locking button **103**. Detail of the joint locks **201** is exemplarily illustrated in FIG. **3**.

[0025] FIG. **4** exemplarily illustrates a bottom view of the adjustable desk **100** with components of the joint locks **201** used to lock the lockable joints **105** and **106**. The first friction plate **201***a* and the second friction plate **201***b* may have non-smooth surfaces. The first friction plate **201***a* is attached to the flat upper panel **101** and the second friction plate **201***b* is attached to each of the leg assemblies **104** at each of the first lockable joints **105**. The first friction plate **201***a* is attached to a first leg segment **104***a* and the second friction plate **201***b* is attached to a second leg segment **104***a* at each of the second lockable joints **106**. The first friction plate **201***a* comprises an elongate shaft **201***d* extending outwards from the first friction plate **201***a*. The second friction plate **201***b* comprises an opening for passing the elongate shaft **201***d*. Detail of the components of the joint locks **201** used to lock the lockable joints **105** and **106** is exemplarily illustrated in FIG. **5**.

[0026] The washer **201***c* may be made of a flexible material, for example, rubber. The washer **201***c* is sandwiched between the first friction plate **201***a* and the second friction plate **201***b*. The washer **201***c* comprises an opening for passing the elongate shaft **201***d*. The washer **201***c* prevents relative motion between the first friction plate **201***a* and the second friction plate **201***b* when the lockable joints **105** and **106** are locked.

[0027] FIG. **6** exemplarily illustrates a perspective view of the locking button **103**. The locking button **103** locks the first friction plate **201***a*, the second friction plate **201***b*, and the washer **201***c* together by exerting a pushing force along the elongate shaft **201***d*. The locking button **103** comprises a socket **602** for housing the elongate shaft **201***d*. The user may exert the pushing force on the locking button **103** toward the first friction plate **201***a* and the second friction plate **201***b* along the elongate shaft **201***d* to lock the lockable joints **105** and **106**. A convex area **601** is provided on the locking button **103** for exerting the pushing force along the elongate shaft **201***d* to lock the lockable joints **105** and **106**. The user may exert a pulling force on the locking button **103** away from the first friction plate **201***a* and the second friction plate **201***b* along the elongate shaft **201***d* to unlock the locked lockable joints.

[0028] When the user exerts a pushing force on the locking button **103** to lock the lockable joints **105** and **106**, the locking button **103**, the second friction plate **201***b*, and the washer **201***c* are pushed towards the first friction plate **201***a*. The washer **201***c* is tightly sandwiched between the first friction plate **201***a* and the second friction plate **201***b*. The rough surfaces of the first friction plate **201***a* and the second friction plate **201***b* tightly grip the washer **201***c*. The tight grip prevents relative motion between the first friction plate **201***a* and the second friction plate **201***b*. Hence, the free rotation about the lockable joints **105** and **106** is prevented when the lockable joints **105** and **106** are locked.

[0029] When the user exerts a pulling force on the locking button **103** to unlock the lockable joints **105** and **106**, the locking button **103**, the second friction plate **201***b*, and the washer **201***c* are pulled away from the first friction plate **201***a*. The tight grip of the first friction plate **201***a* and the second friction plate **201***b* on the washer **201***c* is relaxed, thereby allowing free rotation about the lockable joints **105** and **106**. The lockable joints **105** and **106** may be unlocked for folding the adjustable desk **100** when not in use. The user may unlock the lockable joints **105** and **106** and fold the adjustable desk **100** for easy storage when not in use.

[0030] FIG. **7** exemplarily illustrates a perspective view of the adjustable desk **100** wherein each of the leg assemblies **104** comprises three leg segments **104***a*. The adjustable desk **100** wherein each of the leg assemblies **104** comprises three leg segments **104***a* provides greater flexibility to the user for adjusting height of the leg assemblies **104**.

[0031] FIG. **8** illustrates a method of using multiple joint locks for adjusting angle and height of an activity surface. Multiple joint locks are provided **801** at multiple first lockable joints between a flat upper panel and multiple leg assemblies, and multiple second lockable joints between multiple leg segments of each of the leg assemblies. Each of the joint locks comprises a first friction plate, a second friction plate, a washer, and a locking button. The first friction plate comprises an elongate shaft extending outward from the first friction plate. The activity surface is provided by the flat upper panel.

[0032] The angle of the flat upper panel is adjusted **802** by freely rotating the flat upper panel about the first lockable joints. The height of the leg assemblies is adjusted **803** by freely rotating the leg segments about the second lockable joints. Each of the first lockable joints and the second lockable joints is locked **804** using one of the joint locks. The locking of the first lockable joints and the second lockable joints locks the flat upper panel at the adjusted angle and the leg assemblies at the adjusted height.

[0033] To lock each of the first lockable joints and the second lockable joints, the washer may be sandwiched between the first friction plate and the second friction plate by passing the elongate shaft through an opening in the washer and an opening in the second friction plate. A pushing force may be exerted on the locking button along the elongate shaft to lock the first friction plate, the second friction plate, and the washer together. Each of the first lockable joints and the second lockable joints may be unlocked by exerting a pulling force on the locking button along the elongate shaft.

[0034] Consider an example of a user using the adjustable desk **100** to support a laptop computer while in bed. The user adjusts the angle of the activity surface by adjusting the angle of the flat upper panel **101**. The user unlocks the first lockable joints **105**, adjusts the angle of the flat upper panel **101**, and locks the first lockable joints **105** with the flat upper panel **101** at the adjusted angle using one of the joint locks **201**. The user further adjusts the height of the activity surface by unlocking the second lockable joints **106**, adjusting the height of the leg assemblies **104**, and locking the second lockable joints **106** with the leg assemblies **104** at the adjusted height using one of the joint locks **201**. If the surface on which the adjustable desk **100** is uneven, the user may adjust each of the leg assemblies **104** to a different height. The user places the laptop computer on the flat upper panel **101**. To prevent the laptop computer from accidentally falling off the flat upper panel **101**, the user restrains the laptop computer to the flat upper panel **101** using the restraint band. The restraint band will prevent the laptop computer from falling off the flat upper panel **101** even if the user tilts the adjustable desk **100** to one side. The elevated portion **102** of the flat upper panel **101** further prevents accidental slippage of the laptop computer.

[0035] The user uses the laptop computer while resting wrists on the wrist supports. The wrist supports reduce fatigue of the wrists and forearms of the user. The user may then connect a digital camera, a portable music player, a mouse, and a mass storage device to the laptop computer via the integrated USB hubs of the adjustable desk **100**. The exhaust fans dissipate heat generated by the laptop computer.

[0036] After using the laptop computer, the user releases the laptop computer from the flat upper panel **101**. The user then adjusts the angle of the flat upper panel **101** and the height of the leg assemblies **104** to use the adjustable desk **100** as a table. The user places a bowl of food and a cup of drink on the flat upper panel **101** while eating. After eating, the user may unlock the lockable joints **105** and **106** and fold the adjustable desk **100** for easy storage.

[0037] The foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the present invention. While the invention has been described with reference to various embodiments, it is understood that the words, which have been used herein, are words of description and illustration, rather than words of limitation. Further, although the invention has been described herein with reference to particular means, materials and embodiments, the invention is not intended to be limited to the particulars disclosed herein; rather, the invention extends to all functionally equivalent structures, methods and uses, such as are within the scope of the appended claims. Those skilled in the art, having the benefit of the teachings of this specification, may effect numerous modifications thereto and changes may be made without departing from the scope and spirit of the invention in its aspects.

I claim:

1. A portable apparatus for providing an adjustable activity surface, comprising:

a flat upper panel attached to a plurality of leg assemblies at a plurality of first lockable joints, wherein said flat upper panel is freely rotatable about said first lockable joints on unlocking the first lockable joints for adjusting angle of the flat upper panel;

said leg assemblies, wherein each of the leg assemblies comprises a plurality of leg segments interconnected at second lockable joints, wherein said leg segments are freely rotatable about said second lockable joints on unlocking the second lockable joints for adjusting height of the leg assemblies; and

a plurality of joint locks for locking the first lockable joints and the second lockable joints;

whereby said free rotation about the first lockable joints and the second lockable joints enables adjustment of angle of the flat upper panel and height of the leg segments respectively for said adjustable activity surface.

2. The portable apparatus of claim **1**, wherein each of said joint locks comprises:

a first friction plate comprising an elongate shaft extending outward from said first friction plate;

a second friction plate comprising an opening for passing said elongate shaft;

a washer sandwiched between the first friction plate and said second friction plate for preventing relative motion between the first friction plate and the second friction plate, wherein said washer comprises an opening for enabling the elongate shaft to pass through; and

a locking button for locking the first friction plate, the second friction plate, and the washer together by exerting a pushing force along the elongate shaft, wherein said locking button comprises a socket for housing the elongate shaft.

3. The portable apparatus of claim **1**, wherein the flat upper panel comprises an elevated portion for preventing sliding of an article placed on the flat upper panel.

4. The portable apparatus of claim **3**, wherein the flat upper panel comprises a plurality of wrist supports on either side of said elevated portion.

5. The portable apparatus of claim **1**, further comprising a restraint band for restraining an article to the flat upper panel.

6. The portable apparatus of claim **1**, wherein the flat upper panel comprises a plurality of exhaust fans for dissipating heat generated by an article placed on the flat upper panel.

7. The portable apparatus of claim **1**, wherein the flat upper panel comprises a receptacle for holding articles.

8. The portable apparatus of claim **1**, wherein the flat upper panel comprises a plurality of integrated universal serial bus hubs.

9. A method of using a plurality of joint locks for adjusting angle and height of an activity surface, comprising the steps of:

providing said joint locks at a plurality of first lockable joints between a flat upper panel and a plurality of leg assemblies, and at a plurality of second lockable joints between a plurality of leg segments of each of said leg assemblies, wherein each of the joint locks comprises a first friction plate, a second friction plate, a washer, and a locking button;

adjusting angle of said flat upper panel by freely rotating the flat upper panel about said first lockable joints, wherein the flat upper panel provides said activity surface;

adjusting height of the leg assemblies by freely rotating said leg segments about said second lockable joints; and

locking each of the first lockable joints and the second lockable joints using one of the joint locks;

whereby said locking of the first lockable joints and the second lockable joints locks the flat upper panel at said adjusted angle and the leg assemblies at said adjusted height.

10. The method of claim **9**, wherein said step of locking each of the first lockable joints and the second lockable joints comprises the steps of:

sandwiching said washer between said first friction plate and said second friction plate by passing an elongate shaft through an opening in the washer and an opening in the second friction plate; and

exerting a pushing force on said locking button along said elongate shaft;

whereby the washer prevents relative motion of the first friction plate and the second friction plate, thereby locking the first lockable joints and the second lockable joints.

11. The method of claim **9**, further comprising the step of unlocking each of the first lockable joints and the second lockable joints by exerting a pulling force on said locking button.

* * * * *