



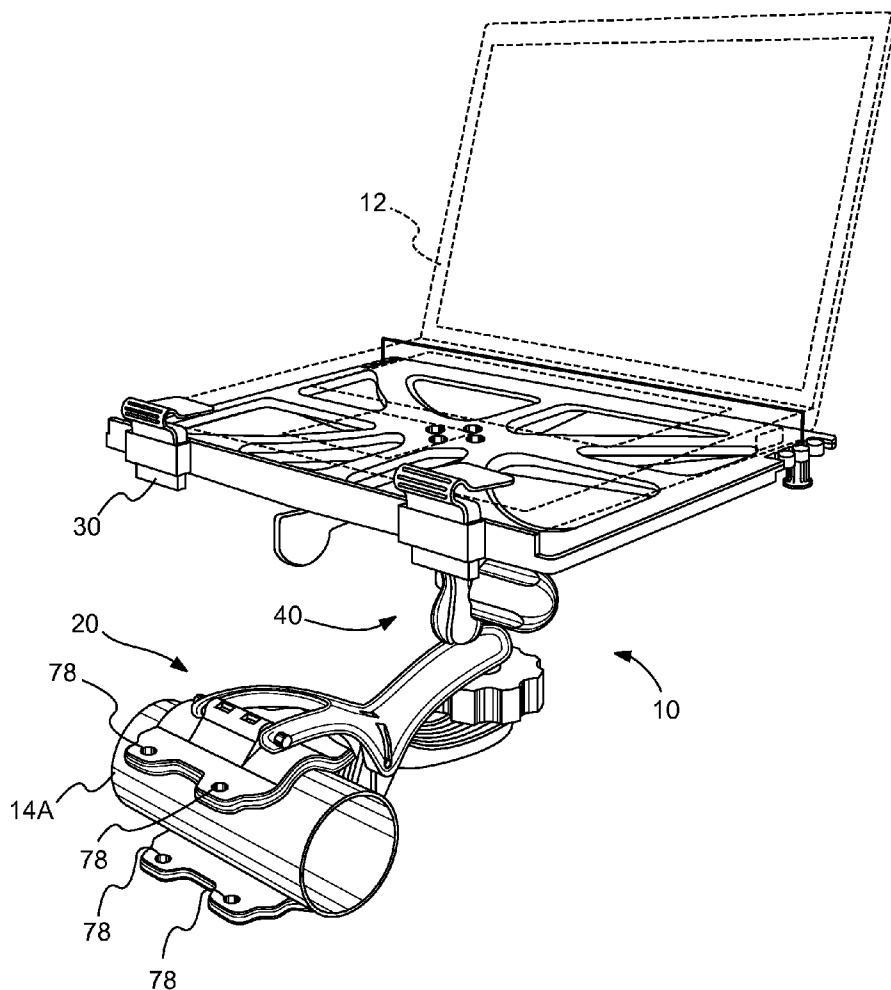
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Sonnenberg(10) **Pub. No.: US 2010/0038505 A1**(43) **Pub. Date: Feb. 18, 2010**(54) **PORTABLE OBJECT SUPPORT**(52) **U.S. Cl. 248/226.11**(76) Inventor: **Juliet Sonnenberg**, Atlanta, GA
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18, 2008.**Publication Classification**(51) **Int. Cl.**
A47B 96/06 (2006.01)(57) **ABSTRACT**

According to one representative embodiment, an adjustable support apparatus for supporting an object includes a coupling mechanism that has a first portion and a second portion. The apparatus also includes a support base that is movably coupled to the first portion of the coupling mechanism in a ball and socket arrangement to form a first joint. The support base includes an object support surface. The apparatus further includes a clamping mechanism that is movably coupled to the second portion of the coupling mechanism in a ball and socket arrangement to form a second joint. The clamping mechanism includes a clamping portion and an adjustment portion. The adjustment portion is adjustable to secure the clamping portion to a fixed structure. The support base is movable relative to the clamping mechanism via the first and second joints.



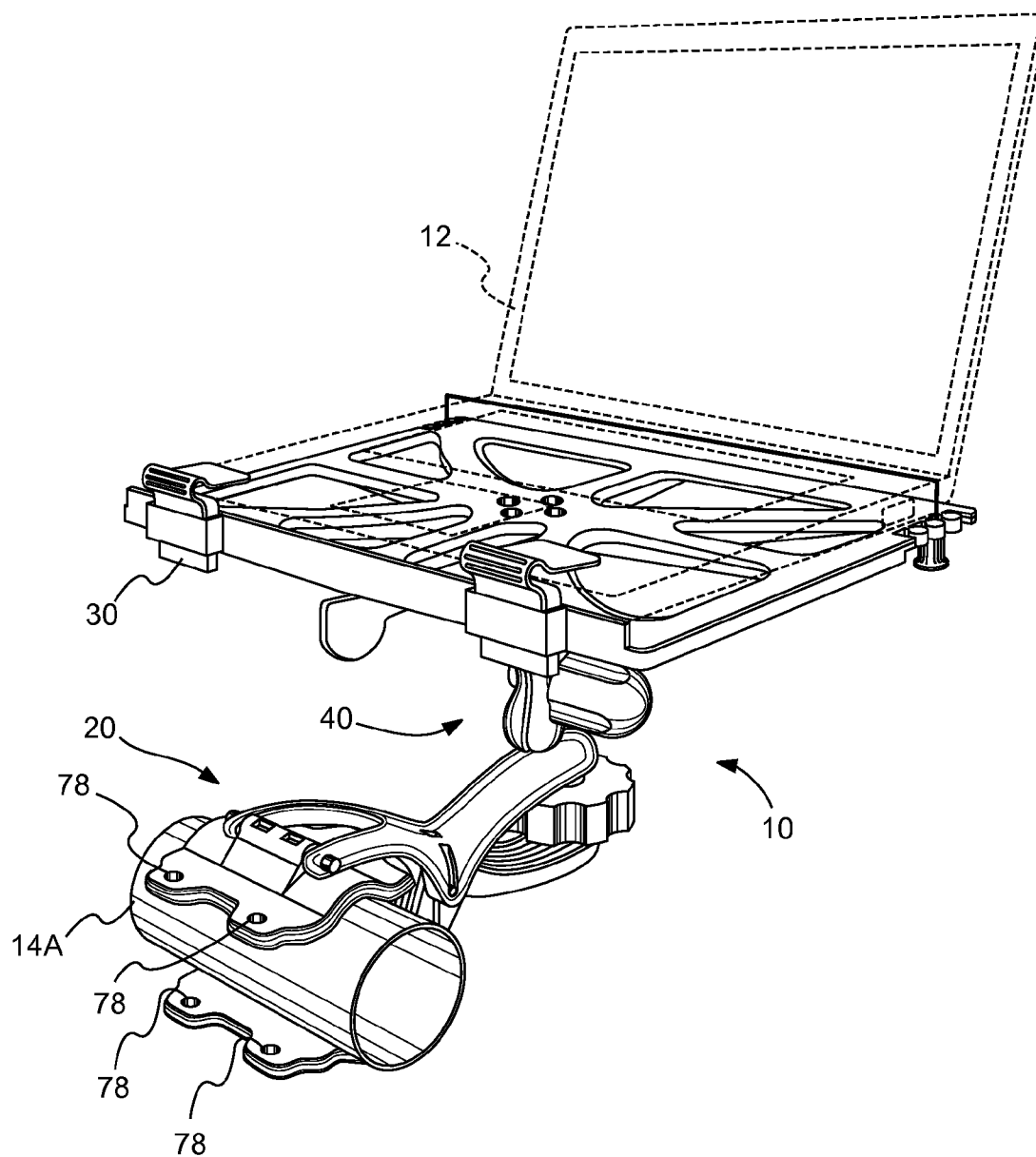


Fig. 1

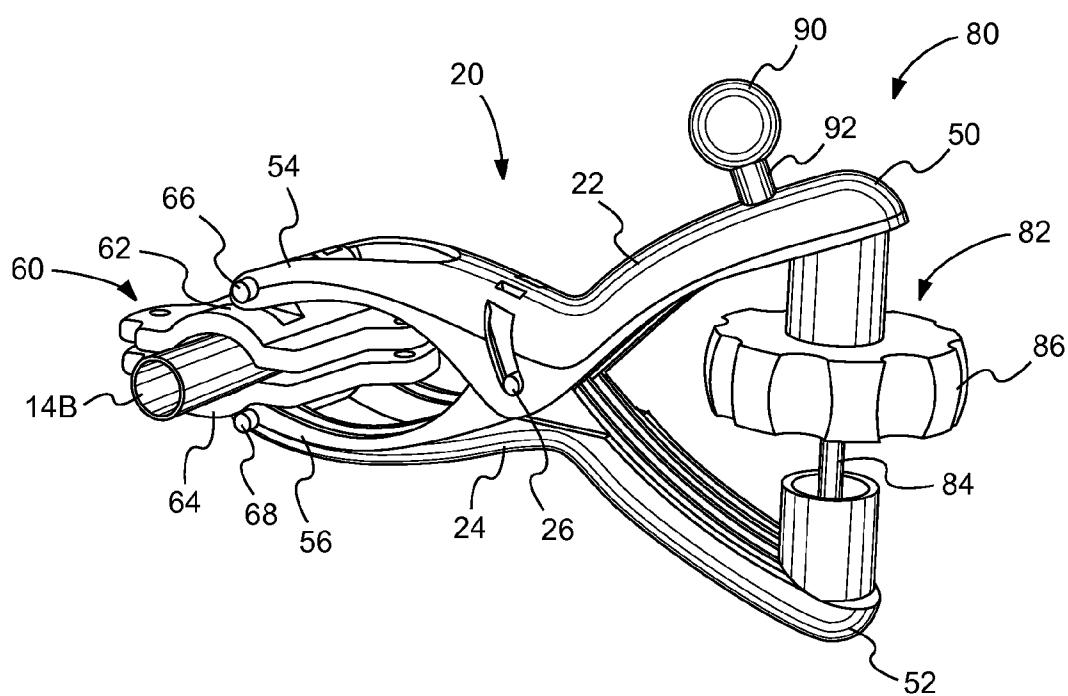


Fig. 2

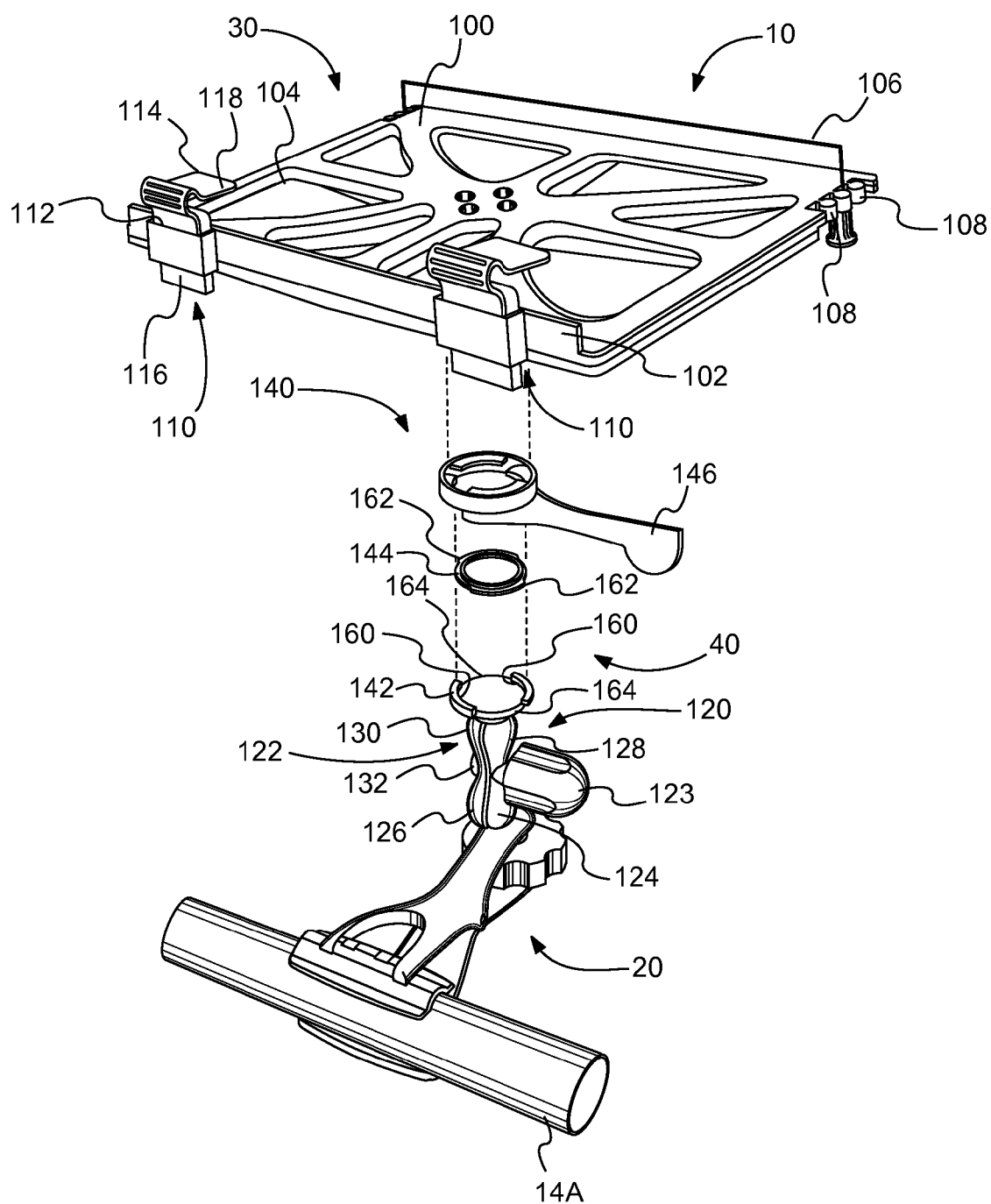


Fig. 3

Fig. 4

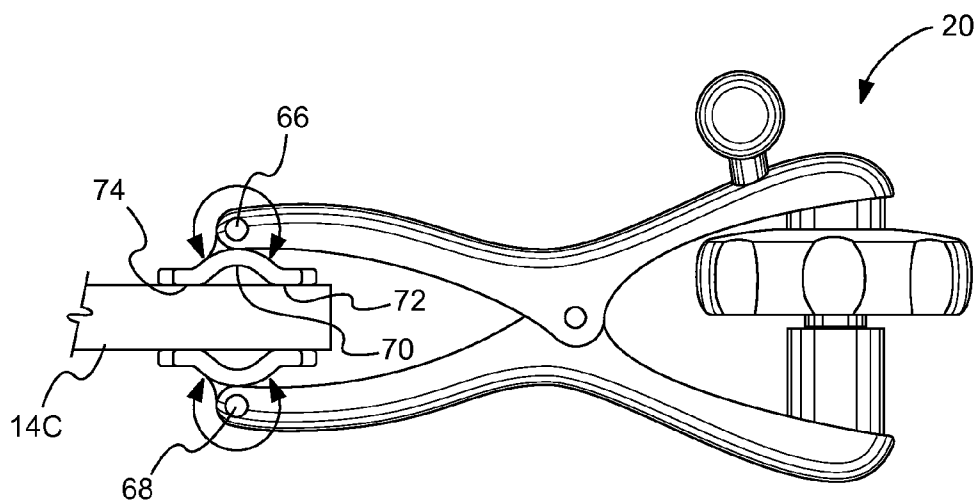


Fig. 5

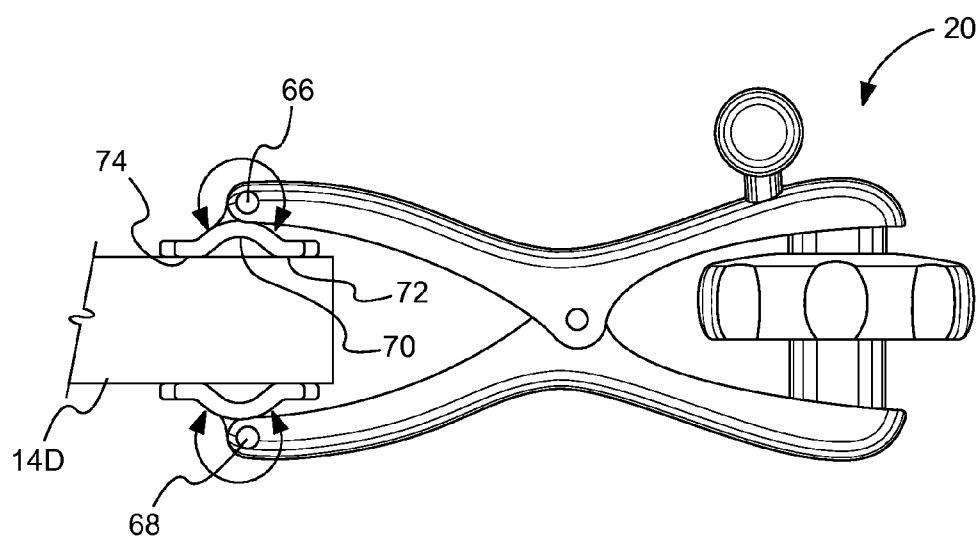


Fig. 6

PORTABLE OBJECT SUPPORT

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 61/089,808, filed Aug. 18, 2008, which is incorporated herein by reference.

FIELD

[0002] This invention relates to object supports and, more particularly, to supports for portable objects, such as laptop computers.

BACKGROUND

[0003] Portable computers, often referred to as laptop computers or notebook computers, are often carried to and used at remote user locations for user convenience and accessibility. Often times, the user location does not include a readily available protected flat space for facilitating comfortable and accessible placement of a portable computer. In some cases, such as in automobiles for law enforcement officers and in automobiles used as portable business offices, a need exists for a portable computer that can be regularly accessed and secured without the need for fixed supports that may permanently block or eliminate usable space.

[0004] Further, a need exists for an object support that is easily transportable and attachable to existing structures in various configurations to provide a portable and adjustable mounting platform for the secure placement of various portable objects, such as portable computers and the like. Additionally, a need exists for an object support that is easily removable or adjustable when not in use for convenient and space-saving relocation and/or storage of the object support.

SUMMARY

[0005] In view of the foregoing, a portable object support that overcomes at least one of the above-mentioned shortcomings of conventional supports and problems associated with use of portable objects at remote locations is disclosed herein. According to one embodiment, the object support includes an adjustable clamping mechanism that is coupleable to a variety of existing fixtures, such as table edges, posts, rails and the like. In some embodiments, the object support may also include a multi-axis mechanism for independently pivoting the support base in any of an infinite number of positions relative to the clamping mechanism.

[0006] According to another representative embodiment, an adjustable support apparatus for supporting an object includes a coupling mechanism that has a first portion and a second portion. The apparatus also includes a support base that is movably coupled to the first portion of the coupling mechanism in a ball and socket arrangement to form a first joint. The support base includes an object support surface. The apparatus further includes a clamping mechanism that is movably coupled to the second portion of the coupling mechanism in a ball and socket arrangement to form a second joint. The clamping mechanism includes a clamping portion and an adjustment portion. The adjustment portion is adjustable to secure the clamping portion to a fixed structure. The support base is movable relative to the clamping mechanism via the first and second joints.

[0007] In some implementations, the support base is coupled to the first portion of the coupling mechanism via a

quick release mechanism. The support base can include a plurality of apertures extending through the object support surface. In certain implementations, the total area of the plurality of apertures is at least equal to the total area of the object support surface. Moreover, in some implementations, the clamping portion includes first and second opposing gripping surfaces between which the fixed structure is securable.

[0008] According to some implementations, the apparatus includes at least one object retention mechanism coupled to the support base. The object retention mechanism is configured to at least partially retain an object on the object support surface. The object support surface can define a height and a width. The at least one object retention mechanism can include an elongate retention element traversing the width of the object support surface. In such instances, the elongate retention element can be positionable in a plurality of positions along the height of the object support surface. In some implementations, the at least one object retention mechanism includes an adjustable clamp.

[0009] In some implementations of the apparatus, the first portion of the coupling mechanism is tightenable to the support base and the second portion of the coupling mechanism is tightenable to the clamping mechanism via a single adjustment mechanism. The clamping mechanism can include a first arm coupled to a second arm where each of the first and second arms includes an adjustment end and a clamping end. Movement of the adjustment ends of the first and second arms away from each other causes the clamping ends of the first and second arms to move toward each other. The apparatus can include an adjustment mechanism coupled to the adjustment ends of the first and second arms where the adjustment mechanism is adjustable to move the adjustment ends of the first and second arms toward and away from each other. The adjustment mechanism can include an adjustment wheel that is rotatable in a first direction to move the adjustment ends of the first and second arms toward each other and in a second direction opposite the first direction to move the adjustment ends of the first and second arms away from each other.

[0010] According to another embodiment, a portable object support includes a first portion for removably supporting an object and a second portion movably coupled to the first portion. The second portion includes first and second opposing gripping surfaces between which an anchored structure is securable. The first and second opposing gripping surfaces each includes at least one concave contact surface and at least one planar contact surface. In certain implementations, each of the first and second opposing gripping surfaces comprises a concave contact surface intermediate two planar contact surfaces. The first and second opposing gripping surface can be rotatable relative to each other and the second portion. Also, in certain implementations, the second portion includes a grip-enhancing material disposed on each of the first and second opposing gripping surfaces.

[0011] In some implementations, the second portion includes first and second tightening mechanisms each operable to secure the anchored structure between the first and second opposing gripping surfaces. The second portion can also include first and second clamping arms that are pivotally coupled to each other. Each of the first and second clamping arms can include a clamping end and tightening end. Moreover, the first and second opposing gripping surfaces can be coupled to the tightening ends of the first and second clamping arms. In such instances, the first tightening mechanism is operable to move the clamping ends of the first and second

clamping arms relative to each other and the second tightening mechanism comprises at least one fastener fastening the first gripping surface to the second gripping surface.

[0012] According to yet another embodiment, a support apparatus for removably securing an object to a fixed structure includes a clamp that includes a first clamping arm pivotally coupled to a second clamping arm. The clamp further includes an adjustment mechanism coupled to first ends of the first and second clamping arms and structure gripping surfaces coupled to second ends of the first and second clamping arms. The first ends are opposite the second ends. The adjustment mechanism is adjustable to secure the structure gripping surfaces to a fixed structure. Additionally, the clamp includes a first ball and the structure gripping surfaces each comprise a concave surface between two flat surfaces. The support apparatus further includes an object support that includes a substantially planar support surface and at least one object retaining mechanism configured to removably retain an object on the support surface. The object support also includes a second ball. The support apparatus additionally includes an adjustment linkage that includes a first socket within which the first ball is positionable and a second socket within which the second ball is positionable. The first ball is movable within the first socket to move the adjustment linkage relative to the clamp and the second ball is movable within the second socket to move the object support relative to the adjustment linkage.

[0013] Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the subject matter of the present disclosure should be or are in any single embodiment. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present disclosure. Thus, discussion of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same embodiment.

[0014] Furthermore, the described features, advantages, and characteristics of the subject matter of the present disclosure may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the subject matter may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments. These features and advantages will become more fully apparent from the following description, and appended claims, or may be learned by the practice of the subject matter as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] In order that the advantages of the subject matter may be more readily understood, a more particular description of the subject matter briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the subject matter and are not therefore to be considered to be limiting of its scope, the subject matter will be described and explained with additional specificity and detail through the use of the drawings, in which:

[0016] FIG. 1 is a perspective view of an adjustable portable object support supporting a portable computer according to one representative embodiment;

[0017] FIG. 2 is a perspective view of a clamping portion of an adjustable portable object support according to one representative embodiment;

[0018] FIG. 3 is an exploded perspective view of a release mechanism of an adjustable portable object support according to one representative embodiment;

[0019] FIG. 4 is a perspective view of a gripping portion of an adjustable portable object support according to one representative embodiment;

[0020] FIG. 5 is a side elevation view of a clamping portion of an adjustable portable object support clamped to a rectangular structure of a first size and shape; and

[0021] FIG. 6 is a side elevation view of the clamping portion of FIG. 5 clamped to a rectangular structure of a second size and shape.

DETAILED DESCRIPTION

[0022] Reference throughout this specification to “one embodiment,” “an embodiment,” or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases “in one embodiment,” “in an embodiment,” and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment.

[0023] Furthermore, the described features, structures, or characteristics described herein may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided to give a thorough understanding of at least some embodiments of disclosed subject matter. One skilled in the relevant art will recognize, however, that the disclosed subject matter may be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the disclosed subject matter.

[0024] Referring to FIG. 1, and according to one embodiment, an object support apparatus 10 is shown. Generally, in some implementations, the object support apparatus 10 is an adjustable portable computer support apparatus for providing a support base or platform for a portable computer (e.g., portable computer 12) or the like. The object support apparatus 10 is coupleable to a relatively fixed structure or anchored object, such as cylindrical structure 14A. The fixed structure or anchored object may be part of a moving object, such as a vehicle, but is substantially anchored relative to the object support apparatus 10. The object support apparatus 10 includes a clamping portion 20, support base or tray 30, and an adjustment linkage 40 adjustably coupling the clamping portion 20 to the support base 30. Although the object support apparatus 10 is shown in FIG. 1 as providing a support for portable computers, it is recognized that the apparatus 10 may be used to support other objects, such as, but not limited to, electronic devices, reading materials, illustrating materials, etc.

[0025] Referring to FIG. 2, the clamping portion 20 includes opposing first and second clamping arms, for example, upper clamping arm 22 and lower clamping arm 24. The upper and lower clamping arms 22, 24 are pivotally coupled together by a hinge pivot 26. Each of the upper and

lower clamping arms 22, 24 extend from respective tightening end portions 50, 52 to respective clamping end portions 54, 56. The hinge pivot 26 acts as a fulcrum positioned intermediate the tightening end portions 50, 52 and the respective clamping end portions 54, 56. In some embodiments, as shown in FIGS. 5 and 6, the hinge pivot 26 is positioned at an approximate mid-point between the tightening end portions 50, 52 and clamping end portions 54, 56. Alternatively, in other embodiments, the hinge pivot 26 can be positioned closer to or further away from the tightening end portions 50, 52 compared to the clamping end portions 54, 56.

[0026] The first and second clamping arms 22, 24 are pivotally attached to each other such that as the tightening end portions 50, 52 separate from each other, the clamping end portions 54, 56 move toward each other. Accordingly, the clamping portion 20 can be secured to a desired relatively fixed structure (e.g., cylindrical structure 14A, 14B) by positioning the structure between the clamping end portions 54, 56, and moving the tightening end portions 50, 52 apart until the clamping end portions sufficiently clamp down on or are sufficiently secured to the fixed structure.

[0027] The clamping portion 20 further includes a gripping portion 60 and tightening portion 80 coupled to the clamping arms 22, 24. The gripping portion 60 includes opposing upper and lower gripping elements 62, 64 each pivotally coupled to a respective clamping end portion 54, 56 via a respective hinge pivot or pin 66, 68. The upper and lower gripping elements 62, 64 are configured to securely grip any of variously sized and shaped fixed structures. Referring to the embodiment illustrated in FIG. 4, the gripping elements 62, 64 each include a generally concave gripping surface 70 intermediate two generally flat or planar gripping surfaces 72, 74. The concave and flat gripping surfaces 70, 72, 74 facilitate secure attachment of the clamping end portions 54, 56 to fixed structures by increasing the surface contact between the gripping elements 62, 64 and the fixed structures. More particularly, in certain implementations, each of the gripping elements 62, 64 is configured to provide at least two spaced-apart points of contact between the gripping element and the mating surface of a fixed structure regardless of the size and shape of the structure. The relative surface areas of the concave and flat gripping surfaces 70, 72, 74 can be varied as desired. For example, in some embodiments, the surface area of the concave gripping surfaces 70 accounts for about half the total surface area of the gripping surface of the gripping elements 62, 64, with the other half being attributed to the flat gripping surfaces 72, 74. However, in other embodiments, the surface area of the concave surfaces 70 can account for between 0% and 100% of the total surface area of the gripping surface, with any remaining surface area being attributed to the flat gripping surfaces 72, 74.

[0028] For example, as shown in FIGS. 1, 3, and 4, the gripping elements 62, 64 are secured to a large curved surface of the cylindrical structure 14A having a first diameter by at least two points of contact. But in FIG. 2, the gripping elements 62, 64 are secured to a small curved surface of the smaller cylindrical structure 14B having a second diameter smaller than the first diameter also by at least two points of contact. The gripping elements 62, 64 can be similarly secured to structures having flat surfaces by at least two points of contact. For example, as shown in FIG. 5, the gripping elements 62, 64 are secured to the flat surfaces of a rectangular structure 14C with a first height, while in FIG. 6, the gripping elements are secured to the flat surfaces of a rectan-

gular structure 14D with a second height larger than the first height. Two spaced-apart points of contact provide a stronger grip compared to single points of contact, such as a single flat surface in contact with a curved surface. In some embodiments, the contact surfaces 70, 72, 74 of each gripping element 62, 64 can have grip-enhancing features formed thereon or be coated with a grip-enhancing material, such as rubber or a polymer gripping material, to enhance the coefficient of friction between the contact surfaces of the gripping elements and the surface or surfaces of the fixture being clamped.

[0029] To further facilitate secure attachment of the clamping portion 20 to fixed structures, the gripping elements 62, 64 are pivotally coupled to the clamping end portions 54, 56 by the hinge pin 66. Referring to FIG. 5, the pivotal connection between the gripping elements 62, 64 and clamping end portions 54, 56 allows the gripping elements to pivot about the hinge pins 66 relative to the clamping end portions as shown by the directional arrows to accommodate differently sized fixed structures. In FIG. 5, the flat surfaces 72, 74 of the gripping elements 62, 64 are parallel to the contact surfaces of the fixed structure 14C to provide a strong grip. As shown in FIG. 6, for larger fixed structures, such as fixed structure 14D, the gripping elements 62, 64 are rotated inward relative to the position of the elements in FIG. 5 as shown by directional arrows. In this manner, the flat surfaces 72, 74 of the gripping elements remain parallel to the contact surfaces of the fixed structure 14D to ensure a strong grip even with a larger fixed structure.

[0030] As can be recognized with the above-described embodiments, gripping elements 62, 64 with both concave and flat contact surfaces provide flexibility for removably securing the clamping portion 20 to any of variously sized and shaped structures. However, in some embodiments, flexibility can be provided in other ways. For example, in certain embodiments, the hinge pins 66, 68 are easily removable such that the gripping elements 62, 64 can be easily removed from the clamping end portions 54, 56. In these embodiments, the gripping elements 62, 64 can be easily removed and replaced by differently sized or shaped gripping elements depending on the size and shape of the fixed structure. For example, in certain implementations, the gripping elements 62, 64 may only have concave contact surfaces conducive to clamping fixed structures with curved surfaces. If a user desires to clamp a flat surface, the gripping elements 62, 64 with only concave contact surfaces can be removed and replaced with gripping elements having only flat contact surfaces. In an alternative example, a user can switch from gripping elements with smaller concave contact surfaces (i.e., smaller radius) to gripping elements with larger concave contact surfaces (i.e., larger radius) if a user desires to move the clamping portion 20 from a small cylindrical structure to a larger cylindrical structure.

[0031] Referring to FIGS. 1 and 4, in some embodiments, the clamping portion 20 includes a secondary tightening mechanism 75 to further secure the gripping elements 62, 64 to a fixed structure. In the illustrated embodiment, the secondary tightening mechanism 75 includes fasteners 76 extendable through holes 78 formed in the gripping elements 62, 64. The fasteners 76 can be bolts threadably mateable with respective nuts 77 to secure the fasteners to the gripping elements 62, 64. Alternatively, the fasteners 76 can be any of various fasteners, such as clips, buckles, latches, Velcro®, and the like. With the gripping elements 62, 64 being clamped to a fixed structure via the tightening portion 80 as will be

described in more detail below, the fasteners **76** can be tightened against the gripping elements to provide an additional clamping force against the fixed structure. In certain applications, such as when the clamping portion **20** will remain secured to a fixed structure indefinitely or for a long period of time, or will not be frequently removed and re-secured to the same or different structure, the secondary tightening mechanism **75** can be used to provide additional clamping force. Alternatively, for highly mobile applications, such as those involving frequent securing and removal of the clamping portion **20** to and from fixed structures, use of the secondary tightening mechanism **75** may not be desirable.

[0032] Referring again to FIG. 2, the tightening portion **80** includes a spreading and tightening or adjustment mechanism **82** intermediate the tightening end portions **50**, **52** of the clamping arms **22**, **24**, respectively. In the illustrated embodiment, the mechanism **82** includes an externally threaded rod **84** extending from the lower tightening end portion **52** toward the upper tightening end portion **54**. The adjustment mechanism **82** also includes at least one rotatable adjuster **86** that is threadably mateable with the threaded rod **84**. The rotatable adjuster **86** can include grip-enhancing features formed in or coupled thereto. The mechanism **82** is configured to create an adjustable biasing spreading force against the tightening end portions **50**, **52**.

[0033] More specifically, as the rotatable adjuster **86** is rotated in a first direction (e.g., tightening direction) relative to the threaded rod **84**, the distance between the two opposing tightening end portions **50**, **52** is increased. Rotating the rotatable adjuster **86** in the tightening direction results in the application of opposing outwardly directed forces to the tightening end portions to bias the tightening end portions away from each other. Biasing the tightening end portions **50**, **52** away from each other correspondingly biases the clamping end portions **54**, **56** toward each other. Moreover, the outwardly directed forces on the tightening end portions **50**, **52** are transferred via the clamping arms **22**, **24** to the gripping elements **62**, **64**, which results in the gripping elements applying opposing inwardly directed forces to a fixed structure to secure the fixed structure between the gripping elements. Further tightening of the rotatable adjuster **86** increases the inwardly directed forces to increase the clamping force on the fixed structure. Once secured, the clamping portion **20** remains secured until the rotatable adjuster **86** is rotated in a second direction opposite the first direction (e.g., loosening direction) to relieve or decrease the outwardly directed forces against the tightening end portions **50**, **52** and the inwardly directed forces against the fixed structure.

[0034] In certain embodiments, the adjustment mechanism **82** can include two or more interchangeable threaded rod and rotatable adjuster assemblies based on the size of the fixed object to which the clamping portion **20** is to be clamped. For example, the tightening end portions **50**, **52** must be separated more for clamping to a small fixed object compared to a large fixed object. Accordingly, the adjustment mechanism **82** can include a rotatable adjuster **86** with a long threaded rod **84** for clamping the clamping portion **20** to a small object (see FIG. 2) and another rotatable adjuster with a short threaded rod for clamping the clamping portion to a large object (see FIG. 4). The rotatable adjusters can be easily decoupled from and coupled to the tightening end portions **50**, **52** such that one adjuster can be easily replaced with another adjuster with a differently sized threaded rod depending on the size of the fixed object.

[0035] Although the illustrated embodiment includes a spreading and tightening mechanism **82** with a threaded rod **84** and rotatable adjuster **86**, in other embodiments, the spreading and tightening mechanism can include a ratcheting mechanism that spreads and tightens the clamp portion **20** in a ratcheting fashion. For example, the threaded rod **84** can be replaced by a linear rack with teeth and the adjuster **86** can be replaced by a pawl and lever assembly that engages the linear rack to separate the tightening end portions **50**, **52**.

[0036] The clamping portion **20** further includes a coupling ball **90** extending substantially upwardly from the upper clamping arm **22** as shown in FIG. 2. The coupling ball **90** can be spaced-apart from the upper clamping arm **22** via a spacer **92**. As will be described in more detail below, the coupling ball **90** facilitates coupling of the clamping portion **20** to the adjustment linkage **40** and thus the support base **30**.

[0037] The various elements of the clamping portion **20** can be constructed of any of a variety of materials that are sufficiently rigid to allow the transfer of force from the tightening end portions **50**, **52** to the clamping end portions **54**, **56**, respectively, and from the gripping elements **62**, **64** to the fixed structure. Exemplary materials can include, but are not limited to, plastics, metal, metal alloys, and/or composites.

[0038] Referring to FIG. 3, the support base **30** includes a support surface **100** and lip **102** extending away from a bottom edge of the support surface. The support surface **100** is substantially flat and may include a plurality of apertures **104** extending therethrough to allow air circulation to reach the supported object or device. The plurality of apertures **104** can include a large number of small apertures or a relatively smaller number of large apertures. Whether large or small apertures **104**, the combined area of the apertures can be substantial relative to the area of the support surface. For example, in one embodiment, a total area of the plurality of apertures **104** is at least equal to a total area of the object support surface **100**. The lip **102** is designed to provide a stop for at least partially maintaining the supportable object, e.g., the personal computer **12**, on the support surface **100**. The support surface **100** and lip **102** can be made of any of various at least partially rigid materials, such as, for example, plastic, metal, composite alloy, and/or hard rubber, that are sufficiently rigid to support a portable object. The lip **102** can have any of various sizes and orientations to restrict a portable object from sliding off of the support base **30** in the event the base is tilted at an angle resulting in slippage of the object relative to the support base. In certain implementations, the lip **102** extends substantially perpendicularly away from the support surface **100**.

[0039] The support base **30** further includes a hold down strap **106** for securing a portable object to the support base. The hold down strap **106** is configured to extend over the supported object to retain the object on the support surface **100**. The hold down strap **28** can be any of various object retaining mechanisms, such as, but not limited to, a rigid bar made of, for example, metal, composite, and/or plastic, or a flexible member, such as a strip of elastic or rubber stretched over the object with sufficient tension to retain the object on the support surface **100**. In some embodiments, the position of the hold down strap **106** relative to the support surface **100** is adjustable to accommodate portable objects of different sizes and shapes. For example, as shown in FIG. 3, the support base **30** can include a plurality of notches **108** formed therein along the side edges of the base. End portions of the hold down strap **106**, such as blunt ends of the strap or stops

secured to the ends of the straps, can engage a pair of corresponding notches **108** to secure the strap to the support base **30**. The end portions of the strap **106** can be disengaged from a pair of notches **108** and engaged with a different pair of notches **108** to adjust the position of the strap.

[0040] In some embodiments, the support base **30** may include additional object securing mechanisms to retain an object on the base. For example, as shown in FIG. 3, the support base **30** includes clamp mechanisms **110** along the bottom edge of the base. The clamp mechanisms **110** each include a slot **112** formed in the bottom edge of the base and a clamp **114** adjustably positionable within the slot **112**. Each clamp **114** includes a U-shaped portion **116** and an object engaging portion **118** extending substantially transversely away from the U-shaped portion. The U-shaped portion **116** includes opposing sidewalls biased in first position. When inserted into the slot **112**, the walls defining the slot **112** cause the opposing sidewalls to resiliently flex inward toward each other. Because the sidewalls are outwardly biased when positioned within the slot **112**, they apply an outwardly directed force against the slot, which removably retains the clamp **114** within the slot. The further the U-shaped portion **116** is inserted within the slot **112**, the stronger the force and the more secure the clamp **114** within the slot **112**. In certain embodiments, the object engaging portion **118** is resiliently movable relative to the U-shaped portion **116**. The clamp mechanisms **110** secure a portable object on the support base **30** by inserting the U-shaped portion **116** of the clamp **114** into the slot **112** with the object engaging portion **118** positioned over the object. The U-shaped portion **116** is pushed into the slot **112** until the object engaging portion **118** contacts and applies a sufficient retaining force on the object. To remove the object, the U-shaped portion **116** is pulled out of the slot with a force greater than the force of the U-shaped portion against the slot **112**.

[0041] Although two clamp mechanisms **110** are shown in the illustrated embodiment, in other embodiments, one clamp mechanism or more than two clamp mechanisms can be used as desired. Moreover, the clamp mechanisms **110** can be located at any of various positions along the bottom edge as desired. Alternatively, or additionally, in some embodiments, clamp mechanisms can be positioned along the side edges of the support base **30**.

[0042] Referring now to FIG. 3, the adjustment linkage **40** couples the support base **30** to the clamping portion **20**. The adjustment linkage **40** includes two at least partially rigid compression halves **120**, **122** coupled to each other by a threaded knob **123**. In certain embodiments, when coupled, the compression halves **120**, **122** have a generally peanut shell shape. Each compression half **120**, **122** includes a respective lower portion **124**, **126** and a respective upper portion **128**, **130**. When the compression halves **120**, **122** are coupled together, the threaded portion of the knob **123** extends through the halves between the lower portions **124**, **126** and upper portions **128**, **130**. As shown, the compression half **122** includes a threaded aperture **132** configured to threadably mate with the threaded portion of the knob **123**.

[0043] When the compression halves **120**, **122** are coupled together, the opposing lower portions **124**, **126** of the compression halves **120**, **122** are operatively juxtaposed about the coupling ball **90** to form an infinitely adjustable ball-and-socket assembly. More specifically, the coupling ball **90** is positionable in any of an infinite number of positions relative to the lower portions **124**, **126** of the adjustment linkage **40**.

[0044] The adjustment linkage **40** further comprises a quick release mechanism **140** configured to removably secure the support base **30** to the compression halves **120**, **122** and facilitate a quick removal of the support base **30** from the adjustment linkage. The quick release mechanism **140** includes a mounting disk **142**, capture disk **144**, and release lever **146**. The mounting disk **142** includes a circular platform with lips or flanges extending about a portion of a periphery of the circular platform. The lips include inwardly facing slots **160**. The mounting disk **142** further includes a second coupling ball (not shown) extending downwardly away from the circular platform. In a manner similar to the first coupling ball **90**, the upper portions **128**, **130** of the compression halves **120**, **122** are operatively juxtaposed about the second coupling ball to provide a second universally or infinitely positionable ball-and-socket assembly. More specifically, the coupling ball of the mounting disk **142** is positionable in any of an infinite number of positions relative to the upper portions **128**, **130** of the adjustment linkage **40**.

[0045] The capture disk **144** includes tabs **162** extending along a portion of the periphery of the capture disk. The tabs **162** are sized to slideably engage the slots **160** of the mounting disk **142** and fit between gaps **164** between the slots. Accordingly, the capture disk **144** is positionable on the circular platform of the mounting disk **142** with the tabs **162** in the gaps **164** between the slots **160**. The capture disk **144** is removably securable to the mounting disk **144** by rotating the capture disk relative to the mounting disk such that the tabs **162** slide within the slots **160**. Similarly, the capture disk **144** is removable from the mounting disk **144** by rotating the capture disk relative to the mounting disk until the tabs **162** slide out of engagement with the slots **160** and align with the gaps **164** between the slots.

[0046] The capture disk **144** is secured to the release lever **146** such that rotation of the release lever correspondingly rotates the capture disk. Additionally, the release lever **146** is pivotally secured to the support base **30** such that the release lever **146** and capture disk **144** are rotatable relative to the support base **30**. The support base **30** is removably coupled to the clamping portion **20** by positioning the support base **30** such that the capture disk **144** is positioned on the mounting disk **142** and rotating the release lever **146** a quarter turn to slide the tabs **162** of the capture disk into the slots **160** of the mounting disk. The quick release linkage **50** is configured to allow the support base **20** to be easily detached from the clamping jaw **30**. More specifically, the support base **20** can be detached (e.g., lifted) from the clamp portion **20** by rotation of the release lever **52** (such as a quarter turn) to position the tabs **162** of the capture disk **144** in line with the gaps **164** between the slots **160** on the mounting disk **142**.

[0047] When the support base **30** is coupled to the clamping portion **20** via the attachment linkage **40**, the attachment linkage **40** facilitates infinite adjustment of the position of the support base (an object supported thereon) relative to the fixed structure. When the adjustment knob **123** is released or loosened, the adjustment linkage **40** is able to pivot about the first coupling ball **90** in any of an infinite number of orientations. Likewise, when the adjustment knob **123** is released or loosened, the support base **30** is able to pivot about the second coupling ball in any of an infinite number of orientations. In other words, as the compression halves **120**, **122** of the adjustment linkage **40** are loosened around respective coupling balls, the adjustment linkage effectively becomes flexible, which allows the support base **30** to swivel about both cou-

pling balls and be adjustable in a multi-axis fashion relative to the clamping portion 20. Once a desired base orientation of the support base 30 is achieved, the base can be secured in place by tightening or re-tightening the adjustment knob 123.

[0048] The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. For example, various embodiments of the disclosed portable object support are described in the several numbered paragraphs below. The described embodiments are to be considered in all respects only as illustrative and not restrictive. More specifically, with respect to the above description, it is to be realized that the optimum dimensional relationships for the parts of the subject matter described herein may include variations in size, materials, shape, form, function, and manner of operation. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. An adjustable support apparatus for supporting an object, comprising:

a coupling mechanism comprising a first portion and a second portion;

a support base movably coupled to the first portion of the coupling mechanism in a ball and socket arrangement to form a first joint, the support base comprising an object support surface; and

a clamping mechanism movably coupled to the second portion of the coupling mechanism in a ball and socket arrangement to form a second joint, the clamping mechanism comprising a clamping portion and an adjustment portion, wherein the adjustment portion is adjustable to secure the clamping portion to a fixed structure;

wherein the support base is movable relative to the clamping mechanism via the first and second joints.

2. The adjustable support apparatus of claim 1, wherein the support base is coupled to the first portion of the coupling mechanism via a quick release mechanism.

3. The adjustable support apparatus of claim 1, wherein the support base comprises a plurality of apertures extending through the object support surface.

4. The adjustable support apparatus of claim 3, wherein a total area of the plurality of apertures is at least equal to a total area of the object support surface.

5. The adjustable support apparatus of claim 1, wherein the clamping portion comprises first and second opposing gripping surfaces between which the fixed structure is securable.

6. The adjustable support apparatus of claim 1, further comprising at least one object retention mechanism coupled to the support base, the object retention mechanism being configured to at least partially retain an object on the object support surface.

7. The adjustable support apparatus of claim 6, wherein the object support surface defines a height and a width, and wherein the at least one object retention mechanism comprises an elongate retention element traversing the width of the object support surface.

8. The adjustable support apparatus of claim 7, wherein the elongate retention element is positionable in a plurality of positions along the height of the object support surface.

9. The adjustable support apparatus of claim 6, wherein the at least one object retention mechanism comprises an adjustable clamp.

10. The adjustable support apparatus of claim 1, wherein the first portion of the coupling mechanism is tightenable to the support base and the second portion of the coupling mechanism is tightenable to the clamping mechanism via a single adjustment mechanism.

11. The adjustable support apparatus of claim 1, wherein the clamping mechanism comprises a first arm coupled to a second arm, each of the first and second arms comprising an adjustment end and a clamping end, wherein movement of the adjustment ends of the first and second arms away from each other causes the clamping ends of the first and second arms to move toward each other.

12. The adjustable support apparatus of claim 11, further comprising an adjustment mechanism coupled to the adjustment ends of the first and second arms, wherein the adjustment mechanism is adjustable to move the adjustment ends of the first and second arms toward and away from each other.

13. The adjustable support apparatus of claim 11, wherein the adjustment mechanism comprises an adjustment wheel rotatable in a first direction to move the adjustment ends of the first and second arms toward each other and in a second direction opposite the first direction to move the adjustment ends of the first and second arms away from each other.

14. A portable object support, comprising:

a first portion for removably supporting an object; and

a second portion movably coupled to the first portion, the second portion comprising first and second opposing gripping surfaces between which an anchored structure is securable, wherein the first and second opposing gripping surfaces each comprises at least one concave contact surface and at least one planar contact surface.

15. The portable object support of claim 14, wherein each of the first and second opposing gripping surfaces comprises a concave contact surface intermediate two planar contact surfaces.

16. The portable object support of claim 14, wherein the first and second opposing gripping surface are rotatable relative to each other and the second portion.

17. The portable object support of claim 14, wherein the second portion comprises a grip-enhancing material disposed on each of the first and second opposing gripping surfaces.

18. The portable object support of claim 14, wherein the second portion comprises first and second tightening mechanisms each operable to secure the anchored structure between the first and second opposing gripping surfaces.

19. The portable object support of claim 18, wherein the second portion comprises first and second clamping arms pivotally coupled to each other, each of the first and second clamping arms comprising a clamping end and tightening end, the first and second opposing gripping surfaces being coupled to the tightening ends of the first and second clamping arms, wherein the first tightening mechanism is operable to move the clamping ends of the first and second clamping arms relative to each other and the second tightening mechanism comprises at least one fastener fastening the first gripping surface to the second gripping surface.

20. A support apparatus for removably securing an object to a fixed structure, comprising:

a clamp comprising a first clamping arm pivotally coupled to a second clamping arm, the clamp further comprising an adjustment mechanism coupled to first ends of the first and second clamping arms and structure gripping surfaces coupled to second ends of the first and second clamping arms opposite the first ends, the adjustment mechanism being adjustable to secure the structure gripping surfaces to a fixed structure, wherein the clamp comprises a first ball and the structure gripping surfaces each comprise a concave surface between two flat surfaces;

an object support comprising a substantially planar support surface and at least one object retaining mechanism configured to removably retain an object on the support surface, wherein the object support comprises a second ball; and

an adjustment linkage comprising a first socket within which the first ball is positionable and a second socket within which the second ball is positionable, wherein the first ball is movable within the first socket to move the adjustment linkage relative to the clamp and the second ball is movable within the second socket to move the object support relative to the adjustment linkage.

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