EUROPEAN PATENT SPECIFICATION

(54) ARTICULATED HUMAN ARM SUPPORT
BEWEGLICHE STÜTZE FÜR DEN MENSCHLICHEN ARM
SUPPORT DE BRAS HUMAIN ARTICULÉ

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(56) References cited:

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Description

BACKGROUND OF THE INVENTION

[0001] The invention relate generally to ergonomic equipment for relieving repetitive workplace stresses, and more particularly to relieving cumulative stresses from work in which the unsupported, human arm, wrist and hand are engaged in protracted reaching.

[0002] Many scientific, medical and industrial tasks involve the hand deployment of lightweight objects or instruments, which must be held aloft and manipulated in space for extended periods of time. The act of ‘pipetting,’ (dispensing small amounts of liquid into numerous receptacles), for example, can require hours of delicate iterations during which the practitioner’s arms remain essentially unsupported. The resulting repetitive stresses are known to be a cause of work-related shoulder and forearm trauma, including rotator cuff and carpal tunnel injuries. Fixed arm supports and supports that permit some lateral motion are known in the art and offer limited forearm and/or wrist relief. Problems arise, however, in connection with the high percentage of such tasks that protractedly require a larger - often much larger - range of horizontal and vertical motions.

[0003] Medical and scientific tasks may involve only lightweight hand-manipulated instruments and devices, but the stress on the practitioner can still be severe, due merely to the outstretched, unsupported weight of his or her arm(s) for the extended duration of these operations. Known ‘ergonomic’ shelf supports, including those on swing arms that provide a degree of lateral freedom, either restrict vertical motions or require awkward arm rotations to perform work above or below the nominal support height.

[0004] Common laboratory operations such as pipetting and ‘emulsion breaking’ however require repeated, unrestricted horizontal and vertical freedom of motion as various instruments are picked up and manipulated and set down. The ‘payload’ may indeed be trivial but the total weight of the operators cantilevered outstretched arm typically varies between three and ten pounds and self-supported can be exhausting over time, resulting in a disturbing number of injuries and lost workdays. Problems are compounded for activities utilizing even larger payloads than are used in laboratory tasks. There are countless such activities in numerous industries.

[0005] ‘Pipetting’ and other medical and scientific operations, including countless surgical, dental and therapeutic procedures, could greatly benefit from having gravity effectively ‘negated’ for the practitioner by iso-elastic means that could also effortlessly parallel all the large and small motions of his or her human arm and wrist in three-dimensional space. Problems arise, however, in providing a comfortable, ergonomically appropriate connection between existing articulated support equipment and the dissimilarly articulated human arm, wrist, and/or hand.

[0006] The human arm is a biological miracle, but it is prone to fatigue, and ultimately to injuries, due to repetitive stress. What is needed is an agile supporting structure between it and an analogously jointed, lifting device, which can indefinitely preserve the unimpeded, multi-axis, angular agility of the human arm, forearm, wrist and hand. Further needed is a preferably lightweight, spring-powered, substantially frictionless mechanical arm, which uses no external power and, which fairly effortlessly follows the user’s intended/hand arm positions while carrying the weight of his or her arm. It should preferably be highly iso-elastic (so it consistently lifts the selected amount of weight from the bottom to the top of its articulating range), and it should be of low inertial mass so it does not require much effort to move it along with rapidly up and down or lateral arm movements. It also preferably should include a ‘centering’ feature so it does not depart from the momentary selected position; and should be substantially frictionless to facilitate forearm rotations in pan, tilt and roll and spatial translations vertically, horizontally and towards/away-from the body of the user.

[0007] In summary, what is needed is a support apparatus that is spatially agile and can counter the weight of an outstretched human arm, wrist, and hand engaged in protracted tasks. US 6 923 505 B2 discloses an arm support system that maintains a neutral position for the forearm. A mechanical support structure attached to a chair or other mounting structure supports the arms of a sitting or standing person.

[0008] WO 03/046431 A1 discloses a camera stabilizing device in which the camera is kept completely stationary with respect to a user.

[0009] US 1 639 815 A discloses an arm splint with components designed to create a specific locked position.

[0010] US 5 135 190 A discloses support structure having two section for supporting a forearm and a hand of an user.

SUMMARY OF THE INVENTION

[0011] The present invention provides an upper body appendage support apparatus as defined in claim 1. Preferred features of the invention are set out in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] For further detail regarding illustrative embodiments of the invention, reference is made to the detailed description provided below, in conjunction with the following figures 2-3, 12-13.

[0013] Figures 1, 4-11, 14-18 show illustrative examples of another support apparatus, which do not form part of the present invention.

Figure 1 is an isometric view of a human arm support including connecting hinge, pivotally connected sup-
port bracket and contoured armrest.

Figure 2 depicts a mechanical support arm appropriate for use in conjunction with an inventive human arm support according to an embodiment of the invention.

Figure 3 depicts a two-axis pivoting connection between the final hinge and the human arm support bracket, including adjusting mechanism for angular displacement of one axis according to an embodiment of the invention.

Figures 4a and 4b show two selectable, vertically displaced pivot locations for the arm support bracket which would provide, respectively, either a slightly bottom heavy or a neutral balance for the human forearm (not shown) on the contoured armrest surface.

Figure 5a shows a compliant beanbag-type rest surface.

Figure 5b shows the rest surface of Figure 5a in use.

Figures 6a and 6b show illustrative uses of the apparatus supporting a human forearm, respectively, tucked back toward the chest and fully extended, to display the angular agility of the arm support as it parallels human arm positions.

Figures 7a and 7b respectively show illustrative uses of an arm support to support the forearm at mid-chest height and fully depressed at waist height, respectively.

Figure 8 shows an operator oppositely positioned as compared to the position depicted in FIGS. 7a and 7b using a human arm support.

Figure 9a shows a human arm support ‘docked’ at a position off to the side of the work area, at a level fixed slightly below mid-height of the full vertical range of the apparatus.

Figure 9b illustrates the undocking procedure as the user’s arm is set upon the armrest surface and lowered just enough to disengage the docking mechanism.

Figures 10a and 10b show a human arm support apparatus mounted respectively above and below the distal end of the equipoising lifting arm to accommodate various work environment obstructions without interference.

Figure 11 shows another apparatus with separate rest surfaces for forearm and heel-of-hand connected by an axis pivot (preferably located below the wrist joint) which permits the heel of the hand to independently rotate vs. the forearm.

Figures 12a and 12b show two embodiments of the invention that include curved, tilting rest surfaces, permitting rotation with the resting forearm and/or heel of hand.

Figure 13 shows an embodiment of a human arm support in which separately pivoting brackets support the heel-of-hand support structure and the forearm support structure and permit relative rotation between them.

Figure 14 shows a user’s arm in a raised position while resting on a support structure.

Figure 15 depicts an arm support structure attached to a wall.

Figure 16 depicts a portion of an arm support apparatus attached to a harness.

Figure 17 depicts an arm supporting apparatus attached to a chair.

Figure 18 depicts an apparatus attached to a table.

DETAILED DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is an isometric view of human arm support 10. It includes connecting hinge 11, pivotally connected support bracket 15 and contoured armrest 17. Pin 24 connects hinge 11 to a mechanical arm at distal pivot location 2. Hinge 11, pivoting on axles 12 and 24 helps provide the angular freedom required by human wrist motions and cantilevers the human arm support laterally from the mechanical lifting arm 1 (shown in FIG. 2) to permit substantially unimpeded human arm function directly alongside the analogous functioning of arm 1.

[0015] A provision for angular adjustment of the arm support apparatus is preferably provided to axially bias the arm supporting shelf to help keep the human forearm aboard or positioned comfortably during various exertions.

[0016] Hinge pivot axle 12 captures ball rod ends 13 which are preferably adjustable to armrest support block 14. Armrest support bracket 15 pivots on axle 16 through bearings mounted within support block 15. Axle locating holes 18 enable selectable fore/aft balancing attitude for bracket 15. Contoured, padded armrest cushion 17 is attached to bracket 15. Its axial position can be trimmed using ball-rod-ends 13 to help prevent the resting human arm (not shown) from being dislodged by sudden lateral moves.

[0017] The mechanical lifting structure attached to embodiments of the inventive arm support preferably com-
prises a double section parallelogram spring arm (see FIG. 2), substantially frictionlessly jointed, including, starting at the proximal end: a hinge with one or more vertical pivots, a first parallelogram segment with four horizontal pivots, a central hinge with one or more vertical pivots, a distal parallelogram segment with four horizontal pivots and a distal vertical pivot. A single parallelogram arm may also be used. Various other hinges, pivots and fastening components may also be employed.

**[0018]** FIG. 2 is an illustrative side view of a preferably iso-elastic mechanical support arm 1 adapted to lift a human arm support. Proximal connector 3 mounts to fixed supports 44 (shown in FIG. 8) or a support harnesses worn by an ambulatory user (an illustrative example of which is shown in FIG. 16). Hinge 5 and pivots 4 provide angular and lateral freedom analogous to that of the human shoulder. Proximal arm segment 6 pivoting on four horizontal axles 6a and distal arm segment 9 pivoting on axles 9a are biased upwardly by resilient mechanisms 41 and 42, the proximal terminations of which (not shown) are adjusted upwardly or downwardly by knobs 25 to alter the amount of effective lift at distal pivot location 2. In preferred embodiments of the present invention, arm segments 6 and 9, respectively, move and lift synchronously with, and analogously to, the human upper arm and forearm, while medial hinge 8 and pivots 7 provide angular functionality analogous to that of the human elbow.

**[0019]** Various spring powered ‘equipoising’ parallelogram arms, such as those employed to support and position payloads such as lamps, x-ray machines and dental equipment, can be employed in embodiments of the invention. Ideally the arm should be iso-elastic. These arms rely to a greater or lesser extent on friction to retain a selected angle or position, but do not necessarily provide consistent lift throughout the entire angular excursion of the parallelogram links.

**[0020]** ‘Equipoising’ arms, such as those described in the patents/applications mentioned above can provide the desired iso-elasticity and lateral and vertical range. Features, such as knob-adjusted payload adjustment to float the range of human arm weights from the lightest to the heaviest, and analogous ‘shoulder, upper arm, elbow and forearm’ segments can be advantageous to illustrative embodiments of the invention.

**[0021]** It is noted that other tensioning mechanisms can be used in place of the springs referred to herein.

**[0022]** FIG. 3 depicts a two-axis pivoting connection between hinge 11 and arm support bracket 15, including adjusting mechanism 13 for angular displacement of one axis according to an illustrative embodiment of the invention. Ball-rod-ends 13 are shown in detail to illustrate the range of angular displacement possible between axle 12 and armrest support block 14. (Note that arm support hinge 11, shown here at an angle to arm support bracket 15, would generally be level with it.) Axle 16 pivots armrest bracket 15 with respect to support block 14 at a raised location 20a to provide pendulum, bottom-heavy mount-

**[0023]** The horizontal arm support pivot can be adjusted with respect to the distal arm end in one or more directions. As the operator may desire, the horizontal arm support apparatus pivot can be positioned above, below or level with the arm resting surface. The pivot can be positioned level with the horizontal center of gravity to provide little or no angular bias, or can be displaced above, or below the center of gravity of the arm to yield a selectable bias for the arm to remain tilted as desired. This pivot can also be adjusted substantially horizontally to provide a bias for the forearm to be angled slightly up or down as the work dictates, or to rebalance fore-and-aft for comfort, in regard to the center of the human’s intrinsic mass.

**[0024]** FIGS. 4a and 4b show another view of the two selectable, vertically displaced pivot locations for arm support bracket 15 which provide, either a slightly bottom heavy (FIG. 4a) or a neutral balance (FIG. 4b) for a supported human forearm (not shown). Axle 16, mounted at location 20a is above the nominal center-of-mass of the forearm (not shown) as it would rest on pad 17, whereas location 20b (FIG. 4b) is closer to the center-of-mass and would more neutrally balance the forearm, and thus would require little or no effort to tilt the arm around axle 16 as the working need dictates.

**[0025]** FIG. 5a shows a beanbag-type armrest pad 21 and FIG. 5b shows armrest pad 21 in use to compliantly facilitate rotation between human forearm 22b and wrist 22a and/or heel of hand 22c. Beanbag 21, containing, for example, buckwheat, flax seeds, beans, plastic balls or other appropriate filler material, provides a compliant surface that can accommodate torsional rotation between wrist and elbow (not shown) due to the twisting range of the radius and ulna forearm bones while promoting the continuing circulation of blood and lymphatic fluids throughout the forearm. The filler material allows the pad to immediately conform to any new arm or hand position. This compliance functions analogously to the "roll" axis of a gimbal in a nautical or camera application. Human arm support 10 transparently permits arm 22 to ‘pan’ (rotate around a vertical axis) and ‘tilt’ (rotate around a horizontal axis perpendicular to the long axis of arm 22). Effective freedom in ‘roll’ however is obtained by the shifting of the internal filler of the beanbag at the heel-of-hand location vs. the more stationary forearm location, in order to accommodate various task-related hand angles. Apparatus that only require forearm support may employ other conventional methods and materials to provide individualized comfort, including microwaveable beanbag versions and vacuum immobilized versions that retain shaped impressions, and interchangeable, custom-molded pads adapted to comfortably support the forearms of various users for long periods of arm-extend-

**[0026]** Working with the arm support above the center of mass of the resting human arm. Bearing hole location 20b and hole 19a (seen positioned adjacent and vertically row of holes 19), could provide a lower, more neutral balance position for axle 16.
FIGS. 6a and 6b show two different lateral and angular displacements of an articulated human arm support apparatus 23, consisting of human arm support 10 moveably connected to mechanical arm 1 and carrying human forearm 28, respectively tucked back toward the chest, and fully extended — illustrating thereby the angular agility of arm support 10, and the two-axis angular isolation between arm support bracket 15 and mechanical lifting arm 1 provided by hinge 11 and pivots 12 and 16.

FIGS. 7a and 7b show another vector of motion of theIso-elastic mechanical arm 1 combined with arm support 10 to carry a human forearm 28 respectively at mid-chest height, and at waist height with the arm against the body. As seen in FIGS. 7a and 7b, the substantially iso-elasticity and reduced friction pivots of arm 1 allow upper parallelogram arm segment 6 and forearm parallelogram segment 9, to rise and fall synchronously (at similar angles) throughout the articulation of arm 1 from its lowest to highest positions - while hinge 11 remains horizontal or at the same angle with respect to the horizontal throughout.

FIG. 8 shows, a deployment position of the combined articulate human arm support 23 opposite to that shown in FIGS. 7a and 7b. The illustrative arm support apparatus 1 is not disposed contiguously alongside the user’s arm as is the case in FIGS. 7a and 7b. Instead, mechanical arm segments 6 and 9, armrest bracket 15 and pad 17 are positioned in front of the worker. Although the typical preferred position of use of mechanical arm 1 would be alongside one of the worker’s shoulders so that the mechanical arm 1 roughly parallels the human upper arm and forearm in both position and angle movement; the use of the arm support as shown in FIG. 8, may also provide a similar and complementary range of angular and spatial positions even though mounted distantly from the human shoulder. This arrangement may be useful, for example if the most suitable mounting location is on a table, such as in a laboratory where a task such as pipetting is to be performed. For tasks performed at a table, workbench, desk, or the like, one or two mechanical arms can be mounted on a chair.

FIG. 9a shows human arm support apparatus 10 fixedly ‘docked’ at a position off to the side of the work area and slightly below mid-height. This apparatus docking ring 26 associated with hinge 11 and pivot pin 24 engages the bottom of proximal hinge pin 27. FIG. 9b illustrates the un-docking procedure as the user’s forearm 28 is set upon the armrest surface 17 and lowered just enough to disengage docking elements 26 and 27.

The human arm support may also suspended from, perched above, or cantilevered alongside the mechanical arm, so that the supported human arm and/or heel of hand is disposed either above, below or alongside the analogously jointed equipoising arm - or extending back to the worker’s arm or hand from a different location, as workplace requirements and spatial obstructions may dictate.

In an apparatus, approximately plus/minus 25 degrees of reduced friction or frictionless axial roll for the resting forearm and/or heel of hand is provided, as workplace hand manipulations may require. Illustrative roll ranges are about 15° to about 35°, and about 20° to about 30°. Analogously to the roll-axis bearing of a gimbaled camera or tool support, these roll plates provide a third degree of rotational freedom that can exceed the roll-axis compliance of the beanbag armrests of FIGS. 5a and 5b or can provide an additional or substitute means of roll.

The arm support apparatus may include a simple padded rest for forearm support, or separate surfaces, pivotally interconnected around one or more axes, to permit relative angular movement between forearm and wrist (and/or heel-of-hand). The rotational freedom between supported forearm and wrist (or heel-of-hand) is partially achieved by a support structure comprising beanbags or buckwheat-filled bags or other compliant media, such as longitudinally disposed, air-filled, toroidal cushions. This can allow the arm and hand to rotate without lifting from, or sliding on the resting support.

Apparatus may also provide additional articulation between the arm-supporting portion of the structure and the hand-supporting portion such that the human forearm and hand may be angularly exercised relative to one another in as many as three roughly perpendicular axes without undue restriction or external influence.
curved support bracket 38 pivotally interconnected by a
preferably and substantially vertical axis pivot 36
(preferably located directly below the wrist joint), which
permits the heel of the hand thereon to independently rotate
side-to-side vs. the forearm resting on forearm rest 37b
held by armrest support bracket 15. The pivot axle 16
which suspends armrest support bracket 15 is located at
a point where the weight of brackets 38 and 15, pads 37
and 37b and the supported hand and forearm is substan-
tially balanced so as to seek a desired work position. The
desired work position will often but not always be sub-
stantially horizontal. This is accomplished by displacing
pivot axis 16 to an appropriate location hole selected from
row 18. Note that continuous adjustments as well as se-
lectable holes are contemplated to alter both vertical and
horizontal centers of balance.

[0037] FIGS. 12a and 12b show embodiments of the human
arm support 10 of FIG. 11 that include semi-cy-
indrical, or otherwise curved, tilting roll-plates 33 permit-
ting rotation of the resting heel-of-hand and the forearm
without lifting from or sliding on the resting surface. Roll
plate 33 contains roller track 35, which accommodates
track rollers 32, allowing roll plate 33 to move accurately,
preferably to plus/minus 25°. Illustrative roll ranges for
roll plate 33 include about 15° to about 35°, and about
20° to about 30°. Track rollers can also be positioned on
the far side but are not visible. The embodiment of FIG.
12a enables additional rotation around vertical axis 36,
which pivotally connects roll-plate track roller support 45
to armrest support bracket 15. Hand rest pad 37a is there-
fore capable of motion in two perpendicular axes relative
to forearm support pad 37b resting on support bracket
15 in order to facilitate complex hand motions with con-
tinuous individual support for heel-of-hand and forearm.

[0038] FIG. 12b shows a tilting roll plate to permit the
forearm, either together with or separate from the heel-
of-hand, a greater degree of rotation than any fixed pad
(or beanbag) support. Armrest pad 31 can be configured
to accommodate only the forearm or it can allow the
forearm and heel-of-hand to rest on it. Armrest pad 31
can be individually molded to fit a wide gamut of arm sizes
and shapes, or custom fitted by means such as of micro-
waveable or vacuum-set beanbags.

[0039] FIG. 13 shows another version of the human
arm support 10 in which parallel axles 39 and 46 respec-
tively suspend the heel-of-hand and the forearm support
assemblies 47 and 48, and permit relative counter-rota-
tion between them, as well as mutual rotation around
primary pivot axis 16. In this embodiment, the hand sup-
port assembly 47 also comprises roll plate 33, and track
35 and rollers 32 to permit relative axial rotation between
hand-rest pad 37a and armrest pad 37b which is attached
to or supported by curved support bracket 38.

[0040] FIG. 14 shows a support arm apparatus in a
raised position, in which portions of mechanical arm 1
and human arm support 10 are above the user’s shoul-
ders.

[0041] FIG. 15 shows a support arm apparatus at-
tached to a wall. The apparatus is attached to the wall at
the proximal arm segment 6 end. Various means of at-
tachment can be used, provided they can withstand the
stresses produced by the intended use of the apparatus
and its weight. The support arm can be attached to other
objects, such as tables or chairs. The support arm struc-
ture is mounted to a harness worn by a user.

[0042] FIG. 16 depicts an example, wherein the prox-
imal end of the arm supporting mechanism 52 is mounted
on a human-carried vest or harness 54 so that work can
be performed in an ambulatory manner, with the arm (or
arms) supported throughout. Various hybrid versions of
this form of attachment are possible, permitting, for ex-
ample, one or two arms to be attached at shoulder height
to the rolling chair employed by a dentist or a surgeon,
and thus keep the support apparatus always appropri-
ately positioned for supporting the practitioner’s fore-
arm(s) for the entirety of extended work sessions.

[0043] An arm supporting apparatus may be attached
to various support structures, including, but not limited
to tables and chairs. FIG. 17A depicts an arm supporting
apparatus 52 attached to the back of a chair 56, FIG. 17B
depicts an arm supporting apparatus 52 attached to the
arm of a chair 56, and FIG. 18 depicts an apparatus 52
attached to a table.

[0044] Apparatus also provides user-adjustment of lift-
ing forces and pivot-axis offsets to tailor support perform-
ance for varying human arm weights, lengths, densities
and operator preferences, and also to accommodate the
bulk and weight of any required protection and/or isola-
tion apparel. Equipoising arm supports can preferably be
hand-adjusted to provide the desired lift.

[0045] In another example, a centering mechanism,
impelled by cams or a resilient mechanism for example,
helps maintain lateral neutrality of position and counter-
act the tendency of pivoted inter-connected links to be
laterally unstable due to accumulated component and
bearing tolerances or other reasons.

[0046] Embodiments of the invention may also provide a
docking/undocking mechanism to permit the upward bias
at the distal end of the arm mechanism to be re-
strained at a convenient position and height so that the
human operator can un-dock it instantly by depressing
the support surface and moving it laterally. Illustrative
hardware includes a hook and mating eye, that permits
immobilizing the entire support arm at a convenient po-
sition and height by, for example, simply swinging over
to that position and permitting the hook to rise into the
receiving eye. The operator can then lift off his or her
own arm to perform other parts of the work that do not
require arm support.

[0047] Illustrative embodiments of the invention may
also be mounted to a harness worn by an ambulatory
worker and allow the performance of protracted tasks
with reduced or eliminated arm fatigue often associated
with of self-support, without exerting undue influence on
the arm and/or wrist throughout the operative extent of
human reach and the area of work accessible by foot.
Any harness that can support the weight of the apparatus, portion of the human body resting on the apparatus, and any devices attached thereto, and that allows for the required amount of movement, is suitable. Harnesses are preferably also ergonomically designed with comfort of the wearer in mind.

Note that other combinations and permutations permitting angular independence between heel of hand and forearm, including those separately disclosed by FIGS. 11, 12 and 13, and descriptions thereof, are contemplated within the scope of the invention.

Following is additional information for regarding the claim language and embodiments described herein.

Reference to "horizontal" and "vertical" throughout is made in a broad sense and is intended to include positions that are about horizontal or vertical. It is further noted that in certain embodiments of the invention, horizontal components can be substituted for vertical components and vice versa.

An upper body appendage is used herein to mean any portion of the appendage that includes the arm, hand and wrist. Throughout the application, the terms "arm" and "hand" include any portions thereof and in some instances can also include the wrist or portions thereof.

Components "attached" or "connected" to the articulating support arm can be attached or connected directly or indirectly, such as to an end block, bracket, etc.

The support to which the articulating support structure can be mounted can be mobile, such as a cart, dolly, or person, can be stationary, such as a post, beam, chair, or table.

Claims

1. An upper body appendage support apparatus (23) comprising at least one articulating support structure (1);
   an upper body appendage support structure (10) movably attached to the articulating support structure (1); the upper body appendage support structure (10) comprising a surface (37a,37b) on which at least a portion of user upper body appendage can rest; wherein the articulating support structure (1) is configured to counteract the weight of the upper body appendage support structure (10) and any weight thereon by providing a lifting force; the upper body appendage support structure (10) comprising two section (47,48) upper body appendage support structure (10), wherein a first section (48) is configured to accommodate a user forearm and a second section (47) is configured to accommodate an appendage portion below the user forearm, characterized in that the upper body appendage support structure (10) comprises one or more roll mechanisms (32, 35) to allow rotation of user upper body appendages about an axis substantially parallel to the user forearm without lifting from, or sliding on upper body appendage support structure (10) resting surface (37a,37b).

2. The support apparatus of claim 1 comprising a docking mechanism to restrain an upward bias of the articulating support structure.

3. The support apparatus of claim 1 comprising a mounting component attached to the articulating support structure for mounting the apparatus to a support.

4. The support apparatus of claim 1 wherein the apparatus is attached to a harness (54) that can be worn by a user.

5. The support apparatus of claim 1 comprising at least one biased hinge for biasing the articulating support structure in a plane substantially perpendicular to a lifting plane of the articulating support structure.

6. The support apparatus of claim 1 wherein the upper body appendage support structure is pivotally connected to the articulating support structure at a pivot point; in particular, comprising an adjustment mechanism to adjust the pivot point of the upper body appendage support structure; wherein the pivot point can be adjusted substantially vertically or wherein the pivot point can be adjusted substantially horizontally.

7. The support apparatus of claim 1 wherein the second section (47) of the upper body appendage support is pivotally attached to the first section (48) of the upper body appendage support.

8. The support apparatus of claim 1 wherein the second section of the upper body appendage support is pivotally attached to the articulating support structure.

9. The support apparatus of claim 1 comprising a roll mechanism (32, 35) functionally connected to the first section (48) and a roll mechanism (32, 35) functionally connected to the second section (47), wherein the axes of rotation of the roll mechanisms are in line with one another.

10. The support apparatus of claim 9 wherein at least one of the roll mechanisms (32, 35) comprises: a roll track (35) having a curved track; one or more track rollers (32) configured to roll on the track to impart rotational capabilities to the resting surface.

11. The support apparatus of claim 1 wherein the roll mechanism provides a degree of rotation of the resting surface is in the range of about 20° to about 30°.
12. A chair (56) comprising an upper body appendage support apparatus (23) according to claim 1.

13. A table (58) comprising an upper body appendage support apparatus (23) according to claim 1.

14. A method of performing a task comprising:
   - providing a support apparatus (23) according to claim 1;
   - placing a user upper body appendage on the resting surface (37a, 37b) having the hand thereof free to perform a task.

Patentansprüche

1. Vorrichtung (23) zum Stützen von Oberkörperextremitäten, die umfasst:
   - wenigstens eine gelenkige Stützstruktur (1);
   - eine Struktur (10) zum Stützen von Oberkörperextremitäten, die beweglich an der gelenkigen Stützstruktur (11) angebracht ist;
   - wobei die Struktur (10) zum Stützen von Oberkörperextremitäten eine Fläche (37a, 37b) umfasst, auf der wenigstens ein Teil einer Oberkörperextremität eines Benutzers aufliegen kann;
   - die gelenkige Stützstruktur (1) so eingerichtet ist, dass sie dem Gewicht der Struktur (10) zum Stützen von Oberkörperextremitäten und etwaigem Gewicht darauf durch Bereitstellen einer Hebekraft entgegenwirkt;
   - die Struktur (10) zum Stützen von Oberkörperextremitäten eine Struktur (10) zum Stützen von Oberkörperextremitäten in zwei Teilabschnitten (47, 48) umfasst, wobei ein erster Teilabschnitt (48) so eingerichtet ist, dass er einen Unterarm des Benutzers aufnimmt, und ein zweiter Teilabschnitt (47) so eingerichtet ist, dass er einen Abschnitt einer Extremität unterhalb des Unterarms des Benutzers aufnimmt, dadurch gekennzeichnet, dass die Struktur (10) zum Stützen von Oberkörperextremitäten einen oder mehrere Roll-Mechanismen (32, 35) umfasst, um Drehung von Oberkörperextremitäten des Benutzers um eine Achse im Wesentlichen parallel zu dem Unterarm des Benutzers ohne Anheben von der Auflagefläche (37a, 37b) der Struktur (10) zum Stützen von Oberkörperextremitäten oder Gleiten darauf zu ermöglichen.

2. Stützvorrichtung nach Anspruch 1, die einen Koppelungsmechanismus umfasst, mit dem eine nach oben gerichtete Spannung der gelenkigen Stützstruktur gehalten wird.

3. Stützvorrichtung nach Anspruch 1, die eine Montagekomponente umfasst, die an der gelenkigen Stützstruktur zum Montieren der Vorrichtung an einem Träger angebracht ist.

4. Stützvorrichtung nach Anspruch 1, wobei die Vorrichtung an einem Gurt (54) angebracht ist, der von einem Benutzer getragen werden kann.

5. Stützvorrichtung nach Anspruch 1, die wenigstens ein vorgespanntes Gelenk umfasst, mit dem die gelenkige Stützstruktur in eine Ebene im Wesentlichen senkrecht zu einer Hebe-Ebene der gelenkigen Stützstruktur gespannt wird.

6. Stützvorrichtung nach Anspruch 1, wobei die Struktur zum Stützen von Oberkörperextremitäten an einem Drehpunkt schwenkbar mit der gelenkigen Stützstruktur verbunden ist;
   - und insbesondere einen Einstellmechanismus zum Einstellen des Drehpunktes der Struktur zum Stützen von Oberkörperextremitäten umfasst, wobei der Drehpunkt im Wesentlichen vertikal eingestellt werden kann oder der Drehpunkt im Wesentlichen horizontal eingestellt werden kann.

7. Stützvorrichtung nach Anspruch 1, wobei der zweite Teilabschnitt (47) der Stütze für Oberkörperextremitäten schwenkbar an dem ersten Teilabschnitt (48) der Stütze für Oberkörperextremitäten angebracht ist.

8. Stützvorrichtung nach Anspruch 1, wobei der zweite Teilabschnitt der Stütze für Oberkörperextremitäten schwenkbar an der gelenkigen Stützstruktur angebracht ist.


10. Stützvorrichtung nach Anspruch 9, wobei wenigstens einer der Roll-Mechanismen (32, 35) eine Rollenbahn (35) mit einem gekrümmten Bahnverlauf, eine oder mehrere Laufrollen (32) umfasst, die so eingerichtet sind, dass sie auf der Bahn rollen, um der Auflagefläche Drehfähigkeit zu verleihen.

11. Stützvorrichtung nach Anspruch 1, wobei der Roll-Mechanismus einen Grad der Drehung der Auflagefläche ermöglicht, der im Bereich von etwa 20° bis etwa 30° liegt.

12. Stuhl (56), der eine Vorrichtung (23) zum Stützen
von Oberkörperextremitäten nach Anspruch 1 umfasst.

13. Tisch (58), der eine Vorrichtung (23) zum Stützen von Oberkörperextremitäten nach Anspruch 1 umfasst.

14. Verfahren zum Ausführen einer Aufgabe, das umfasst:

Bereitstellen einer Stützvorrichtung (23) nach Anspruch 1;
Auflagen einer Oberkörperextremität eines Benutzers auf die Auflagefläche (37a, 37b), wobei seine Hand frei ist, um eine Aufgabe auszuführen.

Revendications

1. Dispositif de soutien d’appendice de haut de corps (23) comprenant au moins une structure de soutien articulée (1);
une structure de soutien d’appendice de haut de corps (10) rattachée de manière mobile à la structure de soutien articulée (1);
la structure de soutien d’appendice du haut de corps (10) comprenant une surface (37a, 37b) sur laquelle au moins une partie d’appendice de haut de corps d’utilisateur peut reposer;
dans lequel la structure de soutien articulée (1) est configurée pour contrebalancer le poids de la structure de soutien d’appendice de haut de corps (10) et tout poids sur celle-ci en fournissant une force de levage;
la structure de soutien d’appendice de haut de corps (10) comprenant une structure de soutien d’appendice de haut de corps (10) à deux sections (47, 48), dans lequel une première section (48) est configurée pour accueillir un avant-bras d’utilisateur et une deuxième section (47) est configurée pour accueillir une partie d’appendice sous l’avant-bras d’utilisateur, caractérisé en ce que la structure de soutien d’appendice de haut de corps (10) comprend un ou plusieurs mécanismes à rouleaux (32, 35) pour permettre une rotation des appendices de haut de corps d’utilisateur autour d’un axe substantiellement parallèle à l’avant-bras d’utilisateur sans se soulever de, ou glisser sur une surface d’appui (37a, 37b) de structure de soutien d’appendice de haut de corps (10).

2. Le dispositif de soutien de la revendication 1 comprenant un mécanisme de solidarisation pour restreindre une inclinaison vers le haut de la structure de soutien articulée.

3. Le dispositif de soutien de la revendication 1 comprenant un composant de montage attaché à la structure de soutien articulée pour monter le dispositif sur un support.

4. Le dispositif de soutien de la revendication 1 dans lequel le dispositif est attaché à un harnais (54) qu’un utilisateur peut porter.

5. Le dispositif de soutien de la revendication 1 comprenant au moins une charnière inclinée pour incliner la structure de soutien articulée dans un plan substantiellement perpendiculaire à un plan de levage de la structure de soutien articulée.

6. Le dispositif de soutien de la revendication 1 dans lequel la structure de soutien d’appendice de haut de corps est connectée en pivot à la structure de soutien articulée à un point de pivot;
en particulier, comprenant un mécanisme d’ajustement pour ajuster le point de pivot de la structure de soutien d’appendice de haut de corps;
dans lequel le point de pivot peut être ajusté substantiellement verticalement ou dans lequel le point de pivot peut être ajusté substantiellement horizontalement.

7. Le dispositif de soutien de la revendication 1 dans lequel la deuxième section (47) du soutien d’appendice de haut de corps est attachée en pivot à la première section (48) du soutien d’appendice de haut de corps.

8. Le dispositif de soutien de la revendication 1 dans lequel la deuxième section du soutien d’appendice de haut de corps est attachée en pivot à la structure de soutien articulée.

9. Le dispositif de soutien de la revendication 1 comprenant un mécanisme à rouleaux (32, 35) connecté de manière fonctionnelle à la première section (48) et un mécanisme à rouleaux (32, 35) connecté de manière fonctionnelle à la deuxième section (47), dans lequel les axes de rotation des mécanismes à rouleaux sont alignés l’un sur l’autre.

10. Le dispositif de soutien de la revendication 9 dans lequel au moins un des mécanismes à rouleaux (32, 35) comprend : une piste de roulement (35) présentant une piste incurvée ; un ou plusieurs rouleaux de piste (32) configurés pour rouler sur la piste pour induire des capacités rotatives à la surface d’appui.

11. Le dispositif de soutien de la revendication 1 dans lequel le mécanisme à rouleaux fournit un degré de rotation de la surface d’appui s’inscrit dans la plage d’environ 20 ° à environ 30 °.

12. Une chaise (56) comprenant un dispositif de soutien
d’appendice de haut de corps (23) selon la revendication 1.

13. Une table (58) comprenant un dispositif de soutien d’appendice de haut de corps (23) selon la revendication 1.

14. Procédé d’exécution d’une tâche comprenant :

fourniture d’un dispositif de soutien (23) selon la revendication 1 ;
Positionnement d’un appendice de haut de corps d’utilisateur sur la surface d’appui (37a, 37b) libérant ainsi la main pour effectuer une tâche.
FIG. 5a
FIG. 13
REFERENCES CITED IN THE DESCRIPTION

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