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(54) **ERGONOMIC ACCESSORY FOR
SMARTPHONES AND OTHER HAND-HELD
PORTABLE ELECTRONIC DEVICES**

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See application file for complete search history.

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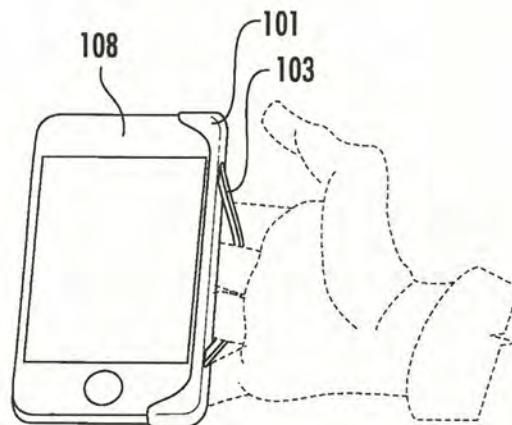
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(57) **ABSTRACT**

Injury to the digits, hand and wrist are associated with the frequent usage of portable hand-held electronic devices ("PEDs"), including but not limited to smartphones. This is true as well for injury to the neck and shoulder areas. The potential for injury to the digits, hand and wrist in particular is anticipated to be exacerbated by the larger smartphones, and especially the tablet-like smartphones. The ergonomic accessory of the invention has several embodiments whose design is intended to ameliorate if not prevent such injuries. Certain embodiments are partially or fully case-like in form so that they envelope to a greater or lesser degree, such hand-held electronic devices. Another embodiment attaches to a PED through an element of the PED such as the charging socket. The accessory also removably attaches the hand of the user or provides a secure holding surface for the user.

19 Claims, 17 Drawing Sheets



ERGONOMIC ACCESSORY FOR SMARTPHONES AND OTHER HAND-HELD PORTABLE ELECTRONIC DEVICES

CROSS-REFERENCE TO RELATED APPLICATION

This non-provisional application claims priority from U.S. provisional application Ser. No. 62/082,314, filed Nov. 20, 2014 and entitled "Adjustable Accessory Having Optional Wearable Technology for Connecting a Hand Held Device to the Finger(s) of the Device User."

BACKGROUND OF THE INVENTION

Field of the Invention

An ergonomic accessory having the various embodiments of the present invention are intended to facilitate the safe use of portable hand-held electronic devices ("PEDs"), particularly smartphones and the larger tablet-like devices often referred to as "phablets." In certain embodiments, this ergonomic accessory is designed to envelope to a greater or lesser degree, and thus attach to a PED in a partial, or fully, case-like manner. Another embodiment involves connection of the ergonomic accessory of the present invention directly to a PED at a single point, or locus, of attachment. This ergonomic accessory, depending on specifically which of the proposed embodiments is chosen and which of the various ergonomic features are employed in its design, is securely joined to the hand of the user by a simple gripping action, or by connection to one or more of the digits of the hand in a tethering action by way of a strategically placed ergonomic cord, the result being a conjoinment of user and PED.

The Related Art

The human hand, and the extended hand/wrist "system," are extraordinarily complex anatomically, comprising a carefully articulated construct of bones, joints, ligaments, tendons, muscles and nerves. Misuse, including excessively frequent, prolonged and/or forceful use, may lead to a variety of adverse musculoskeletal and nervous system health effects commonly referred to as Repetitive Strain Injuries ("RSI's"), known also as "repetitive stress injuries" or "cumulative trauma disorders." Signs of such injury may include aches, pains, soreness, a burning or tingling sensation, spasms, tenderness, swelling and fatigue. Continued overuse may in turn lead to chronic musculoskeletal injuries such as arthritis (particularly at the base of the thumb), tendonitis, bursitis, and de Quervain Syndrome (inflammation, or stenosing tenosynovitis, of the tendon sheath in the thumb). Perhaps the most well known and widely treated such injury is Carpal Tunnel Syndrome, involving inflammation of the sheath surrounding the nerve bundle connecting hand to arm as, for example, a result of excessive keyboard use.

Problems of this type have long been well known and documented in traditional industries. Such injuries started to surface anew globally in the workplace in the 1970s as attributed to the widespread use of computers requiring long periods of repetitive motions at a keyboard. Beginning in the 1980s, with the advent of new personal technologies, issues known in the common vernacular as "Nintendo Thumb" and "Gamer's Grip" were emerging. More recently, neologisms such as "BlackBerry Thumb," "Cellphone Thumb," and

"Texter's Thumb" (all more broadly referred to by some as "iPhonitis") have been applied to injuries related to the use of smartphones in particular.

Recently too, what is referred to as "Text Neck" has drawn a focused concern. This painful condition may result from the extreme bending forward of the head, and the consequent strain to the musculoskeletal system in the neck and shoulder/upper back area, necessary to view and manipulate the screen of a PED when held in its customary (i.e., more horizontal than vertical) position. Overly frequent and/or prolonged PED usage can precipitate or exacerbate this condition.

Determining a specific diagnosis from the symptoms described above may be difficult enough, and drawing a definitive linkage to excessive use of PEDs may be even more speculative yet in each individual circumstance. However, it is clear that as PEDs assume an even more fundamental role in everyone's day-to-day lives, the health issues described above are becoming of increased concern and greater in apparent incidence. Evidence of such problems, certainly from at least an anecdotal viewpoint, are on the rise. The increasing trend toward the use of the larger smartphones (i.e. "phablets") of increased screen size, is fully expected to exacerbate hand injury potential.

Usage of PEDs, smartphones in particular, involves the simple act of gripping the device to make it secure in the hand and to facilitate its manipulation. An excessively tight grip may lead to undue pressure on the soft tissue of the hand and digits; the resultant tissue compression, and its accompanying impact on the nerves and the obstruction of free blood flow, may lead to numbness, a tingling sensation, and other disorders. This is especially so with overly frequent or prolonged PED usage.

Smartphone usage also involves manipulation of the controls of the device by pushing buttons and touching and tapping at the screen surface. The fingers, in various modes and combinations, may be used for these purposes. Soft tissue issues similar to those described above may also occur in the fingers as a result of excessively frequent, prolonged and/or forceful such use.

The thumb alone may be principally involved in the operation of a PED/smartphone when the device is used in one hand only (thereby leaving the second hand free to accomplish other tasks). Soft tissue injury and other more serious problems to the thumb may occur, such as irritation, swelling, strained muscles and inflammation of the tendon sheath of the thumb. Further problems may occur at the base of the thumb when the device is pressed too firmly at this location or when the thumb is repeatedly used in an awkward position to reach all smartphone screen areas.

SUMMARY OF THE INVENTION

The accessory of the present invention, depending on which of its proposed embodiments is chosen, incorporates key ergonomic features, or elements, designed to mitigate adverse health effects to the hand and digits as well as to the neck/upper torso area.

First, the ergonomic accessory, in one embodiment, employs flexible, resilient and compliant cushions integrated into a case-like structure that fully circumscribes the edges of a PED. These cushioned elements are placed at the customary gripping positions of the PED such that the desired ergonomic benefits are realized.

Second, the ergonomic accessory, in another embodiment, incorporates a tether element, or cord, attached at a peculiar and particular location on the accessory body in a configu-

3

ration designed to couple and conjoin the digit(s) and hand of the user to the PED. The tether element joins the body of the ergonomic accessory at two points in such manner that when the ergonomic accessory is attached to the PED, the digit(s), when inserted beneath the tether, will lay between the tether element and the PED. This type of tethering arrangement is proposed in two embodiments, one in which the tether element is located at the side edge of a PED, and one in which the tether element is at the rear face of a PED, when the ergonomic accessory to which the tether element is combined is clipped, or joined to, the PED. The body of the ergonomic accessory is proposed to be of a partial case-like form, and alternatively it may be in the form of a full case-like form which completely circumscribes the periphery of a PED.

The first and second general embodiments of the ergonomic accessory may be employed separately as described, or both embodiments may be combined together in a single embodiment providing the full range of ergonomic advantages.

Alternatively, in a further embodiment of the ergonomic accessory of the invention, the tether element may attach at a single point at the bottom edge of a PED in various manners. The tether element is designed to envelope one or more digits in a loop fashion at its far end with the result of joining the user to the PED such that the accessory's ergonomic benefits are employed.

The ergonomic purposes and benefits of these various embodiments of the accessory of the present invention are set forth in detail below.

A highly flexible, elastic and compressible element will, to a greater or lesser degree, comprise both side edges of a case-like PED/smartphone ergonomic accessory. By compressing and conforming to the shape of the hand and digits pressing along the edges of the accessory, such cushioned side-edge elements of the ergonomic accessory will spread the grip forces acting against the user's soft tissue. Thus, for any given magnitude of grip force that may be exerted, grip pressure (measured as force per unit of area upon which such force is exerted) on the soft tissue will be reduced as the force is extended over a greater total tissue surface area. Soft tissue injury potential will accordingly be diminished.

The sufficiently flexible, form-changing ergonomic side-edge cushion elements of the ergonomic accessory of the present invention will do even more to mitigate soft tissue injury due to mechanical compression. By virtue of conforming to the contours of the hand and digits, the cushioned side-edge elements will, in the first instance, allow for a softening of the grip on the PED necessary to hold and manipulate it without fear of losing control of and/or dropping the device. Simply put, the PED will not so easily be able to slide out of the hand as would be the situation with conventional PED cases having hard, smooth, glossy or polished—and thus slippery—surfaces. The end result is an even further reduction in the pressure exerted against the soft tissue of the hand and digits which is necessary to control a PED.

A textured surface to the ergonomic side-edge cushion elements, coupled with the use of a "sticky" non-slip surficial material used in their construction, will enhance these ergonomic benefits by producing a yet further incremental reduction in the need to tighten the grip on a PED necessary to secure and use it. Additionally, these ergonomic side-edge elements will not only be highly compressible, they will be highly elastic, rebounding to their original shape very quickly. These elastic edges will thus be available to be recompressed so as to provide the desired cushioning effect

4

again and again as the hand and digits are continually moved along the PED edges. The extent to which the side-edge ergonomic elements will be designed to change shape against grip forces will, while maintaining the desired ergonomic benefit, be tempered by the need to allow unfettered movement of the hand and digits necessary for free use of a PED.

A tether element is incorporated into one embodiment of the ergonomic accessory. When the ergonomic accessory is coupled to a PED in the manner intended by virtue of its design, this tether element will be positioned peculiarly, particularly and importantly to reside most proximate to, and facing, the palm of the hand in which the device is used. This ergonomic tether element is described herein in different embodiments to be placed on the ergonomic accessory at its side edge or at its rear face. The ergonomic accessory itself may, as preferred, be of a partial, or a full, case-like design.

The ergonomic tether element will have elastic properties and will have an optimum level of initial elastic tension in its unused, or "resting" position so as to provide both comfort to the user and a secure joining action of the digits of the hand to the ergonomic accessory/PED couplet. To achieve the proper level of tension (and thus tightness) for individual functionality and comfort purposes, the initial tension level of the ergonomic tether element can be adjusted by way of a friction slide incorporated into the ergonomic accessory's design. It is intended that the PED user will insert any digit or combination of digits between the tether and the ergonomic accessory/rear PED surface. In so doing, the tether element will serve to comfortably enfetter, or conjoin, the user to the PED.

The user may insert the digits as little, or as far forward beneath the tether element as he or she wishes to do. In any and all such positions employed, the PED will be securely held for use in defiance of the effects of gravity. In addition, the tether, due to its positioning on the ergonomic accessory, prevents the PED from flipping, or rotating, out of the hand even when the PED is balanced at the very tips of the fingers.

By virtue of the design and properties described above, the tether element of the ergonomic accessory allows the PED user to rotate the palm of the hand to a more vertical position (in relation to the horizontal plane of the screen of the PED) when compared to the use of uncased PEDs or conventional PED cases. This is a subtle but critical advantage in that it allows the thumb to be placed more "over the top" of the screen, thus enabling it to more easily reach all sectors of the device's screen, both near and far, including those screen sectors referred to as the "strain" areas. This places a lower level of strain on the thumb through its less awkward positioning and a reduction in movement required at the extremes of its range of motion. What is accomplished here is a reduction in the degree of abduction of the thumb, an important predisposing factor in the production of RSI to the thumb. This is a special advantage to the use of the larger hand-held phablet devices which are seen in increasing usage. Viewed another way, the thumb has "grown longer" in terms of its ability to manipulate the previously more remote, less reachable screen areas that fall out of the user's "comfort zone." The key to enabling these extreme positional placements and movements of the thumb, and providing the functional and ergonomic benefits described, is the ergonomic accessory's unique positioning of the tether at the extreme edge of the PED proximate to the palm of the hand. Noteworthy too, the more vertical repositioning of the hand allowed through use of the tether has an additional benefit to the wrist, allowing it to remain in a more neutral position of lesser strain.

5

The tethering arrangement described above allows for a looser grip (if not entirely eliminating the need for employment of any gripping action at all) on the PED without fear of it being dropped. This means a more relaxed hand. The correspondingly "softer touch" of the thumb that this enables helps to compensate for its lower degree of dexterity (when compared to the fingers). The net effect is even less strain on the thumb. And, by allowing the thumb to operate more in its comfort zone, rather than at the strained extremes of its range of motion, speedy use of a smartphone—particularly during texting—is not compromised as it might otherwise be.

The tethering arrangement also reduces the need for excessive movement of the four digits of the hand (i.e., those other than the thumb), and the larger hand, to control the PED and manipulate the touch screen, reducing in turn the potential for fatigue and the more serious adverse repetitive motion injury effects.

While, in the use of the ergonomic accessory, the tether element is at its ends fixed in position in relationship to the body of the PED (as may be true of other alternative devices intended to connect the user to the PED), as a concept the tethering arrangement alone confers the advantage of allowing the hand and digits to "roam" spatially in a generally unimpeded way vis a vis the body and screen of the PED. The effect is as though the tether itself is moving in the way that its functionality is maintained. Viewed another way, the PED is in a sense "floating" on the fingertips of the user. The fingers held by the tether element are still able to freely move up and down in the direction of the vertical axis of the PED, and to move further in or out from the grasp of the tether element along the longitudinal axis, or width, of the PED, all the while enabling the ergonomic benefits of the tether as described above to be maintained as the thumb reaches for all areas of the screen, near and far and whenever and wherever needed. As these ergonomic benefits are conferred, the tether element continues to do its job holding the user's digits in a loose relationship (where such looseness too, is an ergonomic advantage), lightly but securely, to the PED.

The tethering arrangement also eliminates the fear of the PED being dropped. Wrist flexion and torsion can thereby be reduced when the effects of gravity are no longer to be feared. The consequent ability to maintain the wrist in a "neutral" position where it is straight, and not bent, will reduce the potential for overuse and injury surfacing at the wrist as well as the hand.

In another embodiment, a cord element of the ergonomic accessory of the present invention may connect to a PED at a single point either directly through a connecting component, or by attachment to a partial or full case-like component enveloping to varying degrees, the PED. At an intermediate point in its length, the cord element is proposed to be looped around one or more digits of the PED user, as preferred, thus completing the PED/user connection. In so doing, all of the ergonomic benefits described in the above section will obtain.

In this embodiment, the ergonomic accessory has the broader purpose of serving as a physical platform into which, as may be desired, a broad and potentially unlimited variety of external technological components related to the function and capability of PEDs may be introduced in a "wearable" form. Decorative components may be added to the cord element as well such that it becomes an item of jewelry, or fashion.

Conventionally, a PED is used with the screen more in the fully, or near fully, horizontal position such that the device

6

can be held securely and not dropped. The result is that the user is viewing the screen with the head tilted downward, very often to an extreme degree. This places the head/neck/shoulder musculoskeletal complex in an unnatural position whereby excessive strain may obtain. Such excessive strain may in turn lead to concomitant pain, injury and other adverse manifestations. This is the essence of what is referred to as the "Text Neck" issue. (The ergonomic design of computer workstations, by considering the viewing angle toward keyboard and video display, involves a focus on eliminating this type of postural extreme so as to provide for user comfort, greater productivity and a reduced injury potential.)

A key ergonomic benefit to the tether or cord elements of the ergonomic accessory of the present invention in its several embodiments, is that in contrast to what is described above, it enables the PED to be held in the near-vertical, or if desired even the fully-vertical, position for viewing and manipulation of the screen. Such is the case even when only the very tips of the fingers are inserted into the tether element as shown in the first two of these figures. This upright use of the PED can be accomplished without fear of a loss of control or dropping of the device. The result is that with head-on viewing of a vertically-positioned screen, the head need not be pitched forward at all, and certainly not to any extreme, thus confronting and providing a solution to the "Text Neck" risk at very outset. And, while this vertical use of the PED is enjoyed, the wrist is held in a more neutral position as a subsidiary, and itself important, ergonomic advantage.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation view of a first embodiment of the ergonomic accessory.

FIGS. 2A and 2B illustrate the first embodiment of the invention in actual usage with different positions of a hand.

FIG. 2C illustrates a typical pattern of deformation of cushions of the first embodiment of the invention.

FIGS. 3A and 3B are perspective views of a second embodiment of the ergonomic accessory having a side-mounted tether element. A dotted line depiction of a PED is included.

FIG. 3C is a perspective view of a third embodiment of the ergonomic accessory having a side-mounted tether element.

FIG. 3D illustrates the second embodiment of the invention with a liner element 102.

FIG. 3E illustrates a fourth embodiment of the ergonomic accessory which employs a slight camber to provide purchase with the PED.

FIG. 3F is an inside elevation view of the second embodiment of the invention.

FIG. 3G is an exploded end section view of FIG. 3F.

FIG. 3H is a cut-away perspective view of FIG. 3D.

FIGS. 4A-4G illustrate various views of the second embodiment of the invention in actual usage.

FIG. 5 is a perspective view of a fifth embodiment of the ergonomic accessory.

FIGS. 6A-6G illustrate various views of the fifth embodiment of the invention in actual usage.

FIG. 7A is a perspective view of a sixth embodiment of the ergonomic accessory.

FIG. 7B is a perspective view of a seventh embodiment of the ergonomic accessory.

FIG. 8 is a perspective view of an eighth embodiment of the ergonomic accessory.

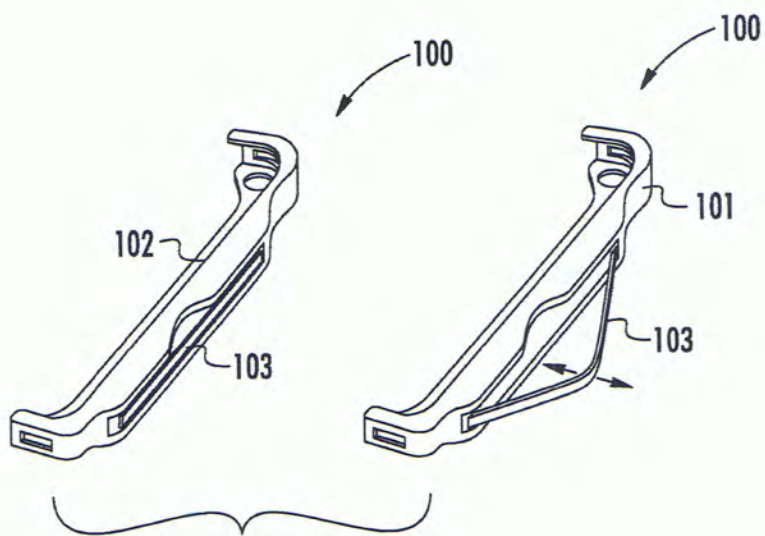


FIG. 3D

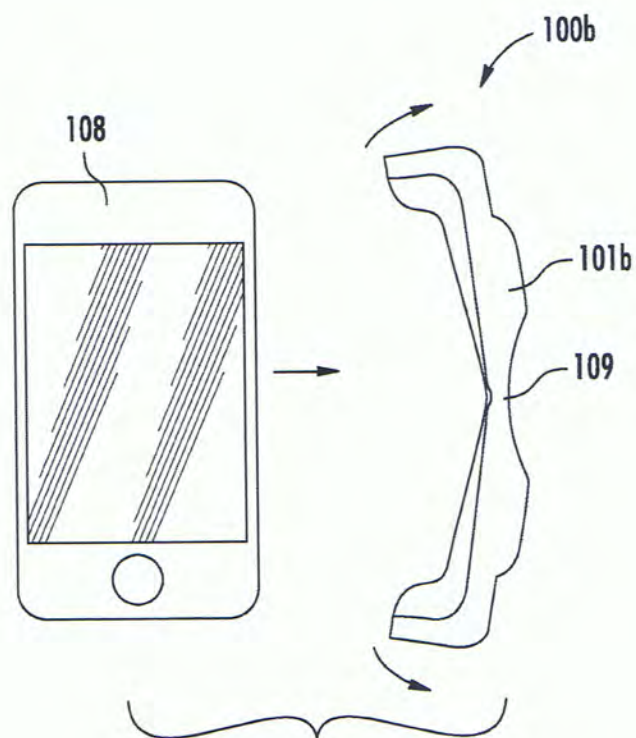
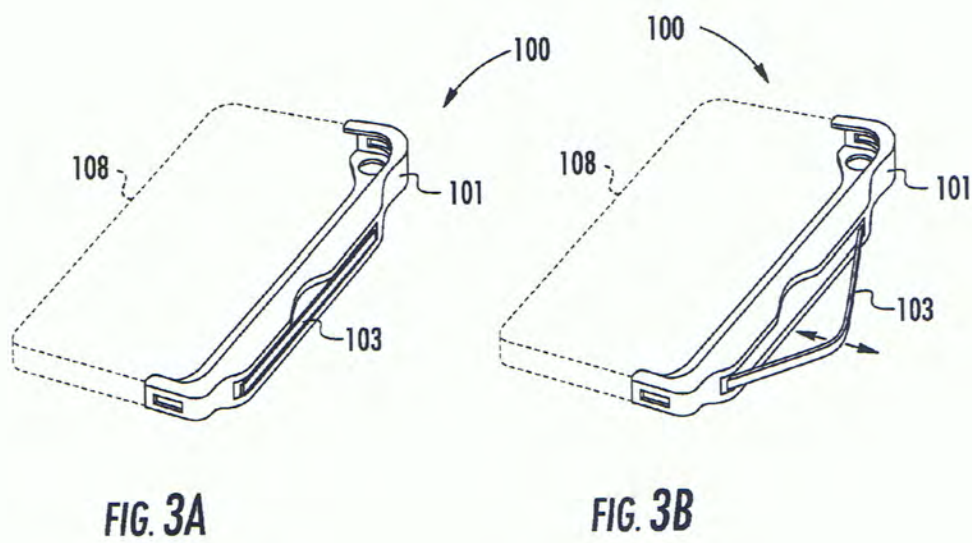
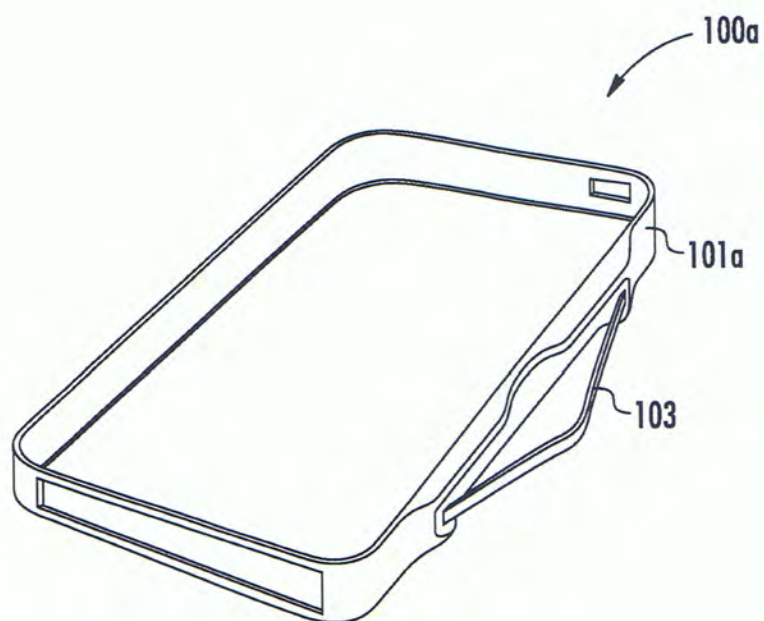


FIG. 3E



**FIG. 3C**