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Quick release mobile device holder

Abstract

Disclosed herein are example mobile device holders having an adjustable retaining device for adjustably sizing a mobile device enclosure. The adjustable retaining device can include one or more adjustable arms extending from the body of the device holder. The adjustable retaining device can also include a corresponding number of engagement members disposed on the ends of the one or more adjustable arms. The one or more adjustable arms and the one or more corresponding engagement members can move from an undeflected state to a deflected state when a mobile device is introduced to the enclosure, and may be biased, for example by spring elements, to return to the undeflected state when the mobile device is removed from the enclosure.

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Background/Summary

RELATED APPLICATIONS (1) This application is a conversion of U.S. Provisional Application No. 63/613,380, filed on Dec. 21, 2023, to which it claims priority.

FIELD

(1) The present disclosure relates generally to mobile device holders and particularly to mobile device holders configured to support one-handed insertion and removal of a mobile phone or other mobile device from the holder.

BACKGROUND

(2) Mobile devices, such as cellular phones and tablets are an integral part of daily life, and are relied on by users in many personal and professional aspects of their routines. Accordingly, there is a desire, and in some cases even a need, for many users to utilize their mobile devices even when they are busy with other tasks, such as operating and driving a vehicle.

(3) However, it can be inconvenient to use a mobile device in an environment where one or both hands are continuously required for other tasks. For example, users operating a vehicle, such as a work vehicle or personal vehicle frequently require one or both hands for steering and/or operating vehicle features. In such circumstances, it can be difficult to keep a mobile device accessible and useable for the vehicle operator, and many current locations for positioning a mobile device while operating a vehicle are inconvenient, distracting, or may provide challenges when accessing the mobile device.

(4) What is needed, then, is a mobile device holder that allows easy docking and undocking of a mobile device, while maintaining the usability of the device even when both hands of the vehicle operator are busy with vehicle operation tasks.

BRIEF SUMMARY

(5) Disclosed herein are example mobile device holders which mount a mobile device in a vehicle. The mobile device holders disclosed herein allow for full (that is, unobstructed) view of the mobile device screen. According to some aspects of the present disclosure, the mobile device holders disclosed herein can include one or more adjustable retaining arms that define or partially define an enclosure for retaining a mobile device. According to some aspects of the present disclosure, one side of the enclosure can be open to facilitate insertion of the mobile device. According to some aspects of the present disclosure, the mobile device can be removed from the enclosure by pulling it against the one or more adjustable retaining arms.

(6) Certain examples concern a self-adjusting mobile device holder. The mobile device holder includes a holder body and a bottom support bracket. The bottom support bracket has a bottom portion extending in a forward direction from a lower portion of the holder body. The mobile device holder also includes a first retaining arm assembly including a first retaining arm and a first gripper portion connected to the first retaining arm, and a second retaining arm assembly including a second retaining arm and a second gripper portion connected to the second retaining arm. The holder body, the bottom support bracket, and the first and second retaining arm assemblies together at least partially define an adjustable enclosure for receiving a mobile device. The first and second retaining arms are connected to opposite lateral sides of the holder body so that the first and second retaining arms can be moved laterally away from and toward each other to adjust a width of the enclosure. The first and second gripper portions are connected to the first and second retaining arms, respectively, so that the first and second gripper portions can be moved in a forward direction away from the holder body to adjust a depth of the enclosure to receive the mobile device in the enclosure or to release the mobile device from the enclosure.

(7) Certain examples concern a mobile device holder. The mobile device holder comprises a holder body at least partially defining an adjustable enclosure. The mobile device holder also comprises an adjustable retaining device configured to retain a mobile device in the adjustable enclosure. The adjustable retaining device is movable from an undeflected state to a deflected state to adjust a size of the enclosure and admit the mobile device to the adjustable enclosure and resiliently biased to automatically return from the deflected state to the undeflected state when the mobile device is removed from the adjustable enclosure. The adjustable retaining device is movable relative to the holder body in at least a first direction and a second direction transverse to the first direction.

(8) Numerous objects, features and advantages of the embodiments set forth herein will be readily apparent to those skilled in the art upon reading of the following disclosure when taken in conjunction with the accompanying drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) A full and enabling disclosure of the aspects of the invention, directed to one of ordinary skill in

the art, is set forth in the specification, which makes reference to the appended figures, in which:

(2) FIG. 1 is a front top perspective view of a mobile device holder according to one aspect of the present disclosure.

(3) FIG. 2 is a top view of the mobile device holder of FIG. 1.

(4) FIG. 3 is a front view of the mobile device holder of FIG. 1.

(5) FIG. 4 is a side view of the mobile device holder of FIG. 1.

(6) FIG. 5 is a schematic showing the insertion of a mobile device into a mobile device holder according to one aspect of the present disclosure.

(7) FIG. 6 is a schematic showing the removal of a mobile device from the mobile device holder of FIG. 5.

(8) FIG. 7A is an exploded partial view of the mobile device holder of FIG. 1.

(9) FIG. 7B is a partial cutaway front view of a mobile device holder according to one aspect of the present disclosure.

(10) FIG. 8 is an exploded view of a mounting system for a mobile device holder according to one aspect of the present disclosure.

(11) FIG. 9 is a perspective view of a mobile device holder according to one aspect of the present disclosure mounted on the mounting system of FIG. 8.

(12) FIG. 10 is a conceptual perspective view of a control assembly and a mobile device holder according to one aspect of the present disclosure mounted to the control assembly.

(13) FIG. 11 is a front view of a mobile device holder according to one aspect of the present disclosure, with retaining arms in a retracted configuration.

(14) FIG. 12 is a front view of a mobile device holder according to another aspect of the present disclosure, with retaining arms in a retracted configuration.

(15) FIG. 13 is a front cutaway view of the mobile device holder of FIG. 12.

(16) FIG. 14 is a close front cutaway view of the bottom portion of the mobile device holder of FIG. 12.

(17) FIG. 15 is an exploded view of the mobile device holder of FIG. 12.

DETAILED DESCRIPTION

(18) Reference will now be made in detail to aspects of the disclosure, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation, not limitation, of the disclosure. It will be apparent to those skilled in the art that various modifications and variations can be made to the examples presented in the present disclosure without departing from the scope or spirit thereof. For instance, features disclosed as part of one example can be used in conjunction with features of another example to yield a still further example. Thus, it is intended that the present disclosure covers such modifications and variations as come within the scope of the claims and their equivalents.

General Terms

(19) The word “exemplary” is used herein to mean “serving as an example, instance, or illustration.” Any implementation described herein as “exemplary” is not necessarily to be construed as preferred or advantageous over other implementations.

(20) As used herein, the terms “first,” “second,” “third,” and so on may be used interchangeably to distinguish one component from another and are not intended to signify location or importance of the individual components.

(21) The terms “coupled,” “fixed,” “attached to,” and the like refer both to direct coupling, fixing, or attaching, as well as indirect coupling, fixing, or attaching through one or more intermediate components or features, unless otherwise specified herein.

(22) The singular forms “a,” “an,” and “the” include plural references, unless the context clearly indicates otherwise.

(23) Unless otherwise indicated, all numbers expressing dimensions of components, percentages, temperatures, weights, and so forth, as used in the specification or claims are to be understood as

being modified by the term “about.” Accordingly, unless otherwise indicated, implicitly or explicitly, the numerical parameters set forth are approximations that can depend on ordinary manufacturing tolerances, minor design variations, or limits of the measuring technique used. When directly and explicitly distinguishing embodiments from discussed prior art, the embodiment numbers are not approximates unless the word “about” is recited. Furthermore, not all alternatives recited herein are equivalents.

(24) Approximating language, as used herein throughout the specification and claims, is applied to modify any quantitative representation that could permissibly vary without resulting in a change in the basic function to which it is related. Accordingly, a value modified by a term or terms, such as “about”, “approximately”, and “substantially”, are not to be limited to the precise value specified. In at least some instances, the approximating language may correspond to the precision of an instrument for measuring the value, or the precision of the methods or machines for constructing or manufacturing the components and/or systems. For example, the approximating language may refer to being within a 1, 2, 4, 10, 15, or 20 percent margin.

(25) Here and throughout the specification and claims, range limitations are combined and interchanged, such ranges are identified and include all the sub-ranges contained therein unless context or language indicates otherwise. For example, all ranges disclosed herein are inclusive of the endpoints, and the endpoints are independently combinable with each other.

Introduction to the Disclosed Technology

(26) Disclosed herein are aspects of a mobile device holder and system for mounting a mobile device holder to one or more features within a vehicle, such as a work vehicle. Generally, the mobile device holders disclosed herein have an enclosure or a partial enclosure configured to receive a mobile device (for example, a mobile phone or a tablet). The mobile device holders disclosed herein generally also include one or more adjustable retaining arms configured to apply a retaining force to retain the mobile device in the enclosure.

(27) According to the aspects of the disclosure presented herein, the mobile device holder can also be mounted on an adjustable mounting arm. The adjustable mounting arm can be attached to one or more features within the cabin of a vehicle (for example, a work vehicle).

(28) Advantageously, this combination of features allows a mobile device to be easily introduced to the mobile device holder, retained in the field of view of a vehicle operator, and used in a hands-free or one-handed fashion. Additionally, this combination of features allows the mobile device to be easily removed from the mobile device holder.

Aspects of the Disclosed Technology

(29) FIG. 1 shows a self-adjusting mobile device holder **100** according to one aspect of the present disclosure. The mobile device holder **100** includes a holder body **102**, a bottom support bracket **104**, and an adjustable retaining device comprising at least one retaining arm assembly **105**, such as the first and second retaining arm assemblies shown in FIG. 1. The retaining arm assembly **105** comprises one or more adjustable retaining arms **106** extending from the holder body **102**, for example, the first and second retaining arms **106** shown in FIG. 1. The holder body **102**, the bottom support bracket **104** and the one or more adjustable retaining arms **106** define or partially define an adjustable enclosure **108** which is configured to receive a mobile device, such as a cellular phone or tablet. According to some aspects of the present disclosure, such as that shown in FIGS. 1-4, the adjustable enclosure **108** can be partial (that is, it can be open or partially open along one or more sides of the adjustable enclosure **108**). It is to be understood, however, that in some aspects of the present disclosure, the adjustable enclosure **108** can be more fully surrounded by the holder body **102**, the bottom support bracket **104** and the one or more adjustable retaining arms **106**.

(30) As shown in FIG. 4, the bottom support bracket **104** and the adjustable retaining arms **106** can extend in a forward direction from a front side of the holder body **102**. A mount **168** can extend in a rearward direction from a back side of the holder body **102**, and can allow the mobile device holder **100** to be connected to a mounting assembly, such as is discussed in greater detail herein in relation

to FIGS. 8 and 9.

(31) Returning to FIG. 1, the bottom support bracket **104** can comprise a bottom ridge bottom portion **110** that extends from a lower portion **112** of the holder body **102**. The bottom ridge portion **110** provides a bottom stop against which a mobile device can rest when the mobile device is retained in the adjustable enclosure **108** of the mobile device holder **100**. According to some aspects of the present disclosure, the bottom ridge portion **110** can also include one or more guides **114** that define a notch or groove that can receive a bottom edge portion of a mobile device, as described in greater detail herein. In such aspects of the present disclosure, the one or more guides **114** can help to secure the bottom edge portion of the mobile device within the adjustable enclosure **108** and prevent inadvertent release and/or escape of the mobile device from the adjustable enclosure **108**.

(32) With continued reference to FIG. 1, the bottom support bracket **104** can also include vertically extending side walls **116**. The side walls **116** can, as shown in FIG. 1, extend upwards along the left side **118** and the right side **120** of the holder body **102**. The side walls **116** serve to define the left and right extremities of the adjustable enclosure **108** and may be spaced apart at a distance to accommodate a variety of mobile devices, such as mobile phones of different widths and/or tablets, which may have greater widths than the mobile phones. It will be appreciated by those skilled in the art that, because of the one or more adjustable retaining arms **106**, discussed in greater detail below, it is not necessary for the width of the space between the side walls **116** of the bottom support bracket **104** to match or even to approximate the width of the mobile device to be retained, as the one or more adjustable retaining arms **106** are capable of retaining mobile devices having a range of widths due to their adjustable nature.

(33) According to one aspect of the present disclosure, the bottom support bracket **104** can also define an access notch **122**, which can, as shown in the example illustrated in FIGS. 1 and 2, be disposed towards the middle of the bottom support bracket **104**. The access notch **122** can provide access to one or more features disposed along the bottom end of a mobile device retained in the adjustable enclosure **108**, such as a charging port, a data input/output port, an audio port, one or more buttons or switches or any other feature that might be accessible along the bottom edge of the mobile device.

(34) Turning now to FIG. 3, the one or more adjustable retaining arms **106** can extend from an upper portion **124** of the holder body **102**, generally downwards towards the bottom support bracket **104** of the mobile device holder **100**. As shown in FIG. 3, the one or more adjustable retaining arms **106** are attached to the holder body **102** at a mounting end portion **126**, which in the case of examples having downwardly-extending adjustable retaining arms **106**, is an upper end portion **126**. It will be further understood that in, some examples, the one or more adjustable retaining arms **106** can be upwardly-extending adjustable retaining arms **106**, and the mounting end portion **126** can be a lower end portion.

(35) The one or more retaining arm assemblies **105** can also include an engagement feature **128**, such as the gripper portions illustrated in FIGS. 1-4, positioned at a second end portion **130** of the retaining arm **106**. Thus, in examples of the mobile device holder **100** having opposing first and second retaining arm assemblies **105**, the first and second retaining arm assemblies can include first and second gripper portions connected respectively to the second end portion **130** of each of the first and second retaining arms **106**. The engagement feature **128** can include a gripping surface **132**, which may engage with one or more portions of a mobile device that is positioned within the adjustable enclosure **108**, to retain the mobile device within the adjustable enclosure **108**. While the illustrated example shows that the engagement feature **128** is an opposed pair of grippers which can pinch inwardly against the side of a mobile device, it will be understood that alternative engagement features **128** can be used in lieu of the grippers shown.

(36) The engagement feature **128** can, according to some aspects of the present disclosure illustrated in FIGS. 1 and 3, be attached to the second end portion **130** of a corresponding

adjustable retaining arm **106** by a hinge **134**. The hinge **134** allows the engagement feature **128** to pivot around the second end portion **130** of the retaining arm **106** to which it is attached, so that the engagement feature **128** can be moved leftwards or rightwards as well as towards or away from the holder body **102**. Advantageously, this allows the width of a gap, *G* (as shown in FIG. 3), between two opposing retaining arms **106**, or between a retaining arm and a side wall **116** of the bottom support bracket **104** to be precisely adjusted by rotating the engagement feature **128** around the second end portion **130** of its corresponding retaining arm **106**. Additionally, this combination of features allows the depth of the adjustable enclosure **108** to be adjusted by rotating the engagement feature **128** around the second end portion **130** on the hinge **134**.

(37) As shown in greater detail in FIG. 7A, the hinge **134** can be formed from a first hinge portion **135a** attached to or integrally formed with the engagement feature **128**, and a second hinge portion **135b** attached to or integrally formed with the second end portion **130** of each of the one or more adjustable retaining arms **106**. The first hinge portion **135a** and the **135b** can interconnect such that a channel **137** is formed extending axially through both the first hinge portion **135a** and the second hinge portion **135b**, as illustrated in FIG. 7A. The channel **137** can receive a post or pin **139**, and the engagement feature **128** can move pivotally around the pin **139** (that is, around a pivot axis or rotation axis parallel to the pin **139**) and either away from or towards the holder body **102**.

(38) According to one aspect of the present disclosure, illustrated in FIGS. 1 and 3, the engagement feature **128** can also include a slanted or angled receiver portion **129**. The receiver portion **129** will catch a descending edge of a mobile device, as discussed in greater detail herein, and cause the engagement feature **128** to pivot on the hinge **134** away from the holder body **102**. Thus, the engagement feature **128** can be positioned at a variable distance from the holder body **102** that accommodates mobile devices of varying thickness automatically upon the introduction of the mobile device to the adjustable enclosure **108**.

(39) In some examples, a radial biasing element **141** (such as the torsion spring **141**) shown in FIG. 7A, can be positioned between the engagement feature **128** and the second end portion **130** of the corresponding retaining arm **106**. The radial biasing element **141** can be positioned such that, as the engagement feature **128** pivots around the pin **139** and away from the holder body **102**, it presses against the radial biasing element **141**. Thus, in example mobile device holders **100** having laterally opposing first and second retaining arm assemblies **105**, the first and second retaining arm assemblies **105** further comprise first and second gripper portion biasing springs that control or partially control the radial positioning of the gripper portions **128**.

(40) The radial biasing element **141** imparts a force that tends to return the engagement feature **128** towards the right side **120**. That is, the engagement feature **128** can have a undeflected state (i.e., positioned towards or against the holder body **102**) and a deflected state (i.e., positioned away from or further away from the holder body **102**), and can pivotally move between the undeflected state and the deflected state. When moving to the deflected state under an external force, such as that imparted by inserting a mobile device into the adjustable enclosure **108**, the engagement feature **128** presses against the radial biasing element **141**. When the external force is removed, the radial biasing element **141** pushes against the engagement feature **128** and returns it to the undeflected state.

(41) According to one aspect of the present disclosure, illustrated in FIGS. 1 and 4, the one or more adjustable retaining arms **106** can be attached to the holder body **102** at a rotatable joint **136** positioned at the mounting end portion **126** of the retaining arm **106**. The rotatable joint **136** can also include a shoulder **150**. As shown in FIG. 1, the shoulder **150** can be flush or substantially flush with the side of the holder body **102** to which the adjustable retaining arm **106** is attached, when the adjustable retaining arm **106** is in the laterally flush position, and deflects inward into a cavity in the holder body **102** as the adjustable retaining arm **106** is moved from the laterally flush position to the laterally deflected position.

(42) As shown in greater detail in FIG. 7B, which depicts a cutaway view of the holder body **102**

and various components of the mobile device holder **100**, the rotatable joint **136** can comprise an annular pivot **138**, which receives a corresponding pivot post **140** that is formed on an internal surface (that is, enclosed within a housing) of the holder body **102**, to pivotably connect the one or more adjustable retaining arms **106** to the holder body **102**.

(43) The one or more adjustable retaining arms **106** can be rotated laterally around the corresponding pivot post **140**. Thus the adjustable retaining arms **106** can rotate around a pivot axis or rotation axis extending parallel to the corresponding pivot post **140**, and transverse relative to the holder body **102**. This moves the adjustable retaining arm **106** from a laterally flush position (that is, a substantially closed configuration of the one or more adjustable retaining arms **106**) to a laterally displaced position (that is, a deflected configuration of the one or more adjustable retaining arms **106**), by pulling or pushing outwards (that is, left for an adjustable retaining arm **106** positioned on the left side of the holder body **102** and right for an adjustable retaining arm **106** positioned on the right side of the holder body **102**) on a retaining arm **106**. This causes the annular pivot **138** to rotate around the corresponding pivot post **140**. It will be appreciated that, in examples with laterally opposing adjustable retaining arms **106** positioned on opposite sides of the holder body **102**, the first and second retaining arms **106** are rotatable around first and second pivot axes extending parallel to first and second posts **140**. In such examples, the pivot axes around which the grippers **128** rotate may be referred to as third and fourth pivot axes, and are transverse to the first and second pivot axes.

(44) When the one or more adjustable retaining arms **106** are pulled laterally outwards relative to the holder body **102**, the width of the gap, *G*, described above, increases. Accordingly, the mobile device holder **100** can be adjusted to accommodate mobile devices of differing widths by rotating the one or more adjustable retaining arms **106** outwards relative to the holder body **102**.

(45) As shown in FIG. 7B, the one or more adjustable retaining arms **106** can also include a projection **142** that extends past the annular pivot **138** on a side opposite the portion of the corresponding retaining arm **106** which extends out of the holder body **102**. The projection **142** can comprise a post **144** that receives one end of a lateral biasing element **146** (for example, a biasing spring like the compression spring shown in FIG. 7B). The other end of the lateral biasing element **146** can connect to a corresponding portion of the holder body **102**. For example, as shown in FIG. 7B, the other end of the lateral biasing element **146** can be received in a slot or bore **148** formed in the holder body **102**. Thus, in example mobile device holders **100** having first and second laterally opposing first and second retaining arm assemblies, the mobile device holder **100** can include first and second retaining arm biasing springs **146**.

(46) When the adjustable retaining arm **106** is rotated away from the holder body **102** as previously discussed, the pivotal motion of the annular pivot **138** around the corresponding pivot post **140** will bring the projection **142** (and therefore the post **144**) closer to the bore **148**, which will compress the lateral biasing element **146**. The lateral biasing element **146** will therefore apply an opposing force to the projection **142**, which will tend to urge the adjustable retaining arm **106** to return to its original position. When a mobile device is retained in the adjustable enclosure **108**, this opposing force will urge the engagement feature **128**, and in particular, the gripping surface **132** of the engagement feature **128** into contact with the mobile device, thus retaining the mobile device either between two opposing adjustable retaining arms **106**, or between an adjustable retaining arm **106** and a side wall **116** of the bottom support bracket **104**, by resiliently biasing the one or more adjustable retaining arms **106** inwards against the mobile device, or towards each other in examples having two opposing adjustable retaining arms.

(47) While FIG. 7B shows an adjustable retaining arm **106** having a projection **142** with a post **144** that opposes a slot or bore **148** with a lateral biasing element **146** that is a compression spring extending between the post **144** and the bore **148**, it will be appreciated that alternative configurations are possible. For example, instead of a lateral biasing element **146** extending diagonally inward from the projection **142** to the bore **148**, the mobile device holder **100** could

include a tension spring extending diagonally outward from the projection **142** to an exterior corner of the holder body **102**. It will be appreciated that other lateral biasing elements **146** can also be used in various alternative aspects of the present disclosure.

(48) As can be seen in FIGS. **1** and **3**, the combination of the holder body **102**, the bottom support bracket **104** and the one or more adjustable retaining arms **106** define the boundaries of the adjustable enclosure **108**. As seen in FIGS. **1** and **3**, the adjustable enclosure **108** is open from the top, bounded to the rear by the holder body **102**, bounded on the sides, front, and bottom by the bottom support bracket **104** and the one or more adjustable retaining arms **106**. Thus, a mobile device can be introduced to the adjustable enclosure **108** through the open top space and secured within the adjustable enclosure **108** by the bottom support bracket **104** and the one or more adjustable retaining arms **106**.

(49) According to one aspect of the present disclosure, the mobile device holder **100** can also include a wireless charger, which can, in some examples, be included in the holder body **102**. For example, in the cutaway view of the holder body **102** shown in FIG. **7B**, a wireless charger **160** comprising one or more inductive coils **162** can be positioned towards a center portion of the holder body **102**. In such examples, the wireless charger **160** can be integrally formed with the holder body **102** to form a unitary component.

(50) The wireless charger **160** can be configured such that at least one of the inductive coils **162** is positioned to align with a corresponding inductive coil in a mobile device, such as mobile device **200**, when the mobile device is secured in the adjustable enclosure **108**. As shown in FIG. **7B**, the wireless charger **160** can include multiple inductive coils **162**, with each positioned differently so that at least one inductive coil **162** will be correctly aligned to charge a variety of wireless devices (such as specific models of cellular phones or tablets), which may include a differently positioned corresponding internal inductive coil for wireless charging.

(51) The wireless charger **160** can be powered by an external power cable **164**. **164** can be connected to the wireless charger **160** through a port, such as a port **166** shown in the left side of the holder body **102** illustrated in FIG. **7B**. The port **166** can include an electrical connector (not shown) which allows the external power cable **164** to be in electrical communication with (and thus to power) the wireless charger **160**. In some examples, the external power cable **164** can be connected to an electrical outlet in the cabin of a work vehicle, such that the wireless charger **160** of the mobile device holder **100** draws power from the work vehicle. Advantageously, in such examples, this combination of features allows the mobile device holder **100** to also function as a charging station for a mobile device, when the mobile device is secured in the adjustable enclosure **108**.

(52) According to one aspect of the present disclosure, as illustrated in FIG. **5**, a mobile device **200** can be introduced to the mobile device holder **100** having two adjustable retaining arms **106**. The mobile device **200** can be introduced downwards from an open top end portion of the mobile device holder **100**, between the adjustable retaining arms **106** and into the adjustable enclosure **108**.

(53) As the mobile device **200** is introduced between the adjustable retaining arms one or more adjustable retaining arms **106**, the adjustable retaining arms **106** are forced laterally apart. The mobile device **200** impinges on the receiver portion **129** of the engagement feature **128** of each of the adjustable retaining arms **106** and causes each of the engagement features **128** to rotate around its corresponding hinge **134** and away from the holder body **102**, and against its corresponding radial biasing element **141**. Thus, the width and depth of the adjustable enclosure **108** is automatically adjusted to accommodate the introduction of the mobile device **200**.

(54) The mobile device **200** is then more fully introduced to the adjustable enclosure **108** until a bottom edge **202** (that is, the leading edge) of the mobile device **200** impinges on the lower portion **112** of the bottom support bracket **104**, at which point downward motion of the mobile device **200** is stopped by the bottom support bracket **104**, with the bottom edge **202** secured by the one or more guides **114**. With the mobile device **200** fully inserted into the adjustable enclosure **108**, the one or

more adjustable retaining arms **106** press in against a left side **204** and a right side **206** of the mobile device **200**, urged inwards by the force applied by the lateral biasing element **146**, and the engagement features **128** apply a retaining force against a front side **208** of the mobile device **200** to keep the mobile device **200** retained against the holder body **102**.

(55) Because the mobile device **200** is engaged only along the bottom edge **202**, the left side **204**, and the right side **206**, there is no obstruction of the screen of the mobile device **200** by any component of the mobile device holder **100**.

(56) According to one aspect of the present disclosure, the mobile device **200** can be removed from the adjustable enclosure **108** of the mobile device holder **100** by pulling forward on a top edge **210** of the mobile device **200**, as illustrated in FIG. **6**. As the mobile device **200** is pulled forward, it presses against the engagement feature **128** on each of the one or more adjustable retaining arms **106** and pushes the engagement feature **128** forward and away from the mobile device **200** to the sides as the engagement feature **128** pivots around the hinge **134**.

(57) The forward pull against the mobile device **200** also causes the mobile device **200** to slide forward away from the one or more adjustable retaining arms **106**. For instance, in the example illustrated in FIG. **6**, the mobile device **200** is pulled out from between the opposing retaining arms **106** as it comes free of the corresponding engagement features **128**. Once the mobile device **200** is pulled out of engagement with the one or more adjustable retaining arms **106**, the lateral biasing element **146** will return the one or more adjustable retaining arms **106** to the original, undeflected position.

(58) As the mobile device **200** is pulled free of the one or more adjustable retaining arms **106** and the engagement feature **128**, it will also tilt forward until the bottom edge **202** comes free of the one or more guides **114**. With the mobile device **200** no longer restrained by the one or more adjustable retaining arms **106** and the corresponding engagement features **128**, or by the one or more guides **114**, it can also come free of the bottom support bracket **104** and thereby exit the adjustable enclosure **108**. When no mobile device, such as mobile device **200** is contained in the enclosure, the biasing elements discussed herein can return the retaining assembly to the original, undeflected position.

(59) Thus, with the combination of features in the various aspects described above, a mobile device, such as mobile device **200**, can be introduced to the adjustable enclosure **108** of the mobile device holder **100** and removed therefrom by a user using only one hand, with the mobile device **200** secured in the adjustable enclosure **108** of the mobile device holder **100** by the one or more adjustable retaining arms **106** and the bottom support bracket **104** until the user is ready to remove the mobile device **200** from the adjustable enclosure **108**.

(60) According to one aspect of the present disclosure, the mobile device holder **100** (and any mobile device retained in the adjustable enclosure **108** of the mobile device holder **100**) can be mounted to a feature inside the cabin of a vehicle, such as a work vehicle, by a mounting device, such as the mounting arm **300** illustrated in FIG. **8**. As shown in FIG. **8**, the mounting arm **300** can comprise a lateral member **302**, which can be mounted at a first end portion **304** to a feature on the control display **350**.

(61) The mounting arm **300** can also include a mounting feature **306** positioned towards a second end portion **308** of the lateral member **302**. For example, as illustrated in FIG. **8**, the mounting feature **306** can comprise one or more apertures **310** and a corresponding number of securing bolts **312** that extend through the apertures and connect with one or more corresponding features on a back side of the holder body **102** (for example, the mount **168**, shown in FIG. **4**), which can have corresponding channels or bores which receive a shaft portion **314** of the bolts **312**.

(62) Thus, the mobile device holder **100** can be mounted to the second end portion **308** of the lateral member **302**, and the first end portion **304** of the lateral member **302** can be attached to a feature inside the cabin of the work vehicle to mount the mobile device holder **100** (and thus any mobile device retained within the adjustable enclosure **108** of the mobile device holder **100**) to a

stationary location within the cabin of the work vehicle, such as to a right side portion **352** of the control display **350**, as illustrated in FIG. **9**.

(63) According to one aspect of the present disclosure, the mounting arm **300** can also be adjustable. For example, the lateral member **302** can comprise a telescoping component that allows the length of the lateral member **302** to be adjusted. Additionally or alternatively, the mounting arm **300** can be mounted to the control display **350** or the display arm **404** on a swiveling or pivoting mount (not shown), which allows the mobile device holder **100** and thus the mobile device **200** retained in the adjustable enclosure **108** of the mobile device holder **100** to be adjusted in one, two, or three dimensions relative to the control display **350**. Advantageously, such a combination of features allows for adaptable, one-handed repositioning of the mobile device holder **100** and the mobile device **200** depending on the location of the mobile device holder **100** and the mobile device **200** preferred by the user (i.e., the vehicle operator).

(64) Turning now to FIG. **10**, a control assembly **400** can include a control display **350** attached to a console **402**, by a display arm **404** which extends vertically from the console **402**. The mounting arm **300** (as shown in FIG. **8**) can extend from the control display **350** or from the display arm **404**, and can support the mobile device holder **100**. The mobile device holder **100** can contain the mobile device **200**, which is supported adjacent to the control display **350**. Thus, the mobile device **200** and the control display **350** can be positioned such that the screens of both are simultaneously visible to a user positioned to the lefthand side of the control assembly **400**, such as an operator seated in a working vehicle having a cabin that contains the control assembly **400**.

(65) Advantageously, the mobile device **200** can be introduced to and/or removed from the mobile device holder **100** with one hand and can be viewed and utilized without any need for the user to shift position, or to move the mobile device holder **100** or the mobile device **200**. Furthermore, the positioning of the mobile device holder **100** (and therefore any mobile device **200** contained within the mobile device holder **100**) can be arranged such that a user can view the viewscreen of the mobile device **200** as well as a viewscreen **354** of the control display **350** with no adjustments or only minor adjustments of the user's field of view.

(66) It will be appreciated that, while FIG. **10** depicts the mobile device holder **100** (and therefore the mobile device **200** retained in the adjustable enclosure **108** of the mobile device holder **100**) positioned at the end of the mounting arm **300** extending to the right hand side of the control display **350**, in order to accommodate an operator seated to the left of the control assembly **400**, in another example, the mobile device holder **100** can instead be positioned at the end of the mounting arm **300** extending to the left hand side of the control display **350**, which may be convenient if the vehicle operator is seated to the right of the control assembly **400**. It will also be appreciated that, in some examples, the mounting arm **300** can be positioned so that the mobile device holder **100** and the mobile device **200** are positioned above the control display **350**.

(67) It will be appreciated by one of skill in the art that solutions alternative to the mounting arm **300** for mounting the mobile device holder **100** to an interior portion of a cabin of a work vehicle are possible, based on the desired mounting location, proximity to or distance from, the control display **350** of the mobile device holder **100** and the mobile device **200**. For instance, merely as an illustrative example, the mobile device holder **100** can be mounted directly to an edge portion of the control display **350** by a clip or clamp that can be dismounted, moved, and remounted as needed by the vehicle operator.

(68) Also disclosed herein are example mobile device holders with a retaining device comprising two interlocked and opposing retaining arms, as shown in FIGS. **11-15**.

(69) FIG. **11** shows a mobile device holder **500** according to one aspect of the present disclosure. The mobile device holder **500** may include features that are common with the mobile device holder **100** previously described, except for the differences discussed herein. For example, the mobile device holder **500** includes a holder body **502** and a bottom support bracket **504** that together partially form an adjustable enclosure **506**, similar to the holder body **102** and the bottom support

bracket **104** of the mobile device holder **100**.

(70) The mobile device holder **500** also includes one or more retaining arm assemblies **508**. For example, the mobile device holder **500** shown in FIGS. **11-15** includes a first retaining arm assembly **508a** and a second retaining arm assembly **508b**, which are laterally opposed to each other and further define the adjustable enclosure **506**.

(71) As shown in FIG. **11**, the one or more retaining arm assemblies **508** can each comprise a retaining arm **510**, which extends from the holder body **502**. As illustrated in detail in FIGS. **13** and **15**, a retaining arm **510** according to one aspect of the present disclosure can include a mounting end portion **512**, a free end portion **514**, and a retaining arm member **516** extending between the mounting end portion **512** and the free end portion **514**.

(72) According to one aspect of the present disclosure, the holder body **502** can also include a faceplate **518**, as shown in FIG. **15**. In such examples, the retaining arm **510** can extend from behind the faceplate **518** to in front of the faceplate **518**. More particularly, the mounting end portion **512** of the retaining arm **510** can be positioned behind the faceplate **518**. The retaining arm member **516** can include a forwardly extending portion **520** that extends forward past a front face of the faceplate **518**, such that a portion of the retaining arm **510** and the free end portion **514** are positioned forward of the faceplate **518**. It will be appreciated, however, that in some examples, the entirety of the retaining arm **510** can be positioned forward of the faceplate **518**.

(73) As shown in FIGS. **13** and **15**, the retaining arm **510** can be attached to the holder body **502** at the mounting end portion **512**. For example, the mounting end portion **512** can include an aperture **532** that receives a pivot post **534**. This arrangement of features rotatably connects the retaining arm **510** to the holder body **502** of the mobile device holder **500**. For example, the retaining arms **510** can rotate laterally around the corresponding pivot post **534** to which it is attached. Thus, each retaining arm **510** can rotate around a pivot axis or rotation axis (designated in FIG. **15** by the character A) extending parallel to the corresponding pivot post and transverse relative to a surface **536** of the faceplate **518**. Accordingly, this allows for the retaining arms **510** to be moved from a laterally retracted position, where a spacing, W, between the retaining arms **510** is at a minimum or substantial minimum, as shown in FIG. **11**, to a laterally extended position, where the spacing W is increased, as shown in FIG. **12**.

(74) With reference to FIGS. **13** and **14**, the mounting end portion **512** of the retaining arms **510** can comprise a gear portion **522**, which is disposed around the **520**. When the mobile device holder **500** comprises two laterally opposed retaining arm assemblies **508**, such as in the example shown in FIGS. **11-15**, a first retaining arm **510a** can comprise a first gear portion **522a**, and the second retaining arm **510b** can comprise a second gear portion **522b**. According to one aspect of the present disclosure, the first gear portion **522a** and the second gear portion **522b** can interlock, as shown in FIGS. **13** and **14**.

(75) In such examples, the movement of the first retaining arm **510a** and the second retaining arm **510b** are coupled, such that when the first retaining arm **510a** moves from the laterally retracted position to the laterally extended position (as shown in FIGS. **11** and **12**), the interaction of the first gear portion **522a** and the second gear portion **522b** correspondingly moves the second retaining arm **510b** from the laterally retracted position to the laterally extended position, or vice versa. Advantageously, this ensures that the retaining arm assemblies **508** open symmetrically, ensuring that a mobile device introduced to the adjustable enclosure **506** is centered within the mobile device holder **500**.

(76) As shown in FIGS. **13** and **14**, the retaining arms **510** can also include a projection **524** that extends past the **518** on the mounting end portion **512** of the retaining arm **510**. The projection **524** includes a post **526** that receives one end of a lateral biasing element **528** (for example, a biasing spring like the compression spring shown in FIG. **14**). The other end of the lateral biasing element **528** can be received in a slot or bore **530**, in a similar fashion to the arrangement of the lateral biasing element **146**, the bore **148**, and the post **144** previously

introduced in relation to the mobile device holder **100**. It will be appreciated that, while the example depicted in FIG. **14** shows a single lateral biasing element **528** extending between the post **526** and the bore **530**, in some examples, the mobile device holder **500** can include a second lateral biasing element lateral biasing element **528**, such that each one or more retaining arm assemblies **508** has a lateral biasing element **528** disposed between it and the holder body **502**.

(77) The retaining arm assemblies **508** can also comprise a gripper portion **538** attached to the free end portion **514** of the retaining arms **510** on a hinge **540**, as illustrated in FIGS. **11-13**. The hinge **540** allows the gripper portion **538** to pivot around the free end portion **514** of the retaining arm **510** to which it is attached, so that the gripper portion **538** can be moved leftwards or rightwards as well as towards or away from the holder body **502**. Advantageously, this allows the width of a gap, **W** (as shown in FIGS. **11** and **12**), between the opposing retaining arms **510** to be precisely adjusted by rotating the engagement feature **128** around the free end portion **514** of its corresponding retaining arm **510**, similarly to the adjustment of the similar features of the mobile device holder **100** previously discussed. Additionally, this combination of features allows the depth of the adjustable enclosure **506** to be similarly adjusted.

(78) As shown in greater detail in FIG. **15**, the hinge **540** can be formed from a first hinge portion **540b** attached to or integrally formed with the gripper portion **538**, and a second hinge portion **540a** attached to or integrally formed with the free end portion **514** retaining arm **510**. The first hinge portion **540b** and the **526b** can interconnect such that a channel **542** is formed extending axially through both the first hinge portion **540b** and the second hinge portion **540a**, as illustrated in FIG. **15**. The channel **542** can receive a post or pin **544**, and the gripper portion **538** can move pivotally around the pin **544** (that is, around a pivot axis or rotation axis parallel to the pin **544**) and either away from or towards the holder body **502**.

(79) According to one aspect of the present disclosure, as illustrated in FIGS. **11** and **12**, the gripper portion **538** can include a receiver portion **546**. The receiver portion **546** can further include features similar to those previously discussed in relation to the receiver portion **129** previously introduced in relation to the mobile device holder **100**.

(80) In some examples, the one or more retaining arm assemblies **508** further include a radial biasing element **548** (such as the torsion spring **548**) shown in FIG. **15**. The radial biasing element **548** can be positioned between the gripper portion **538** and the free end portion **514** of the retaining arm **510** and can function in a substantially similar way to the radial biasing element **141** previously introduced in relation to the mobile device holder **100**.

(81) According to some examples, such as that illustrated in FIGS. **11-15**, the retaining arm **510** of each of the one or more retaining arm assemblies **508** is attached to a bottom end portion **550** of the holder body **502**, such that the one or more retaining arm assemblies **508** extend upwards from the bottom end portion **550** of the holder body **502** towards a top end portion **552** of the holder body **502**. It will be appreciated, however, that in other examples, the retaining arm **510** of each of the one or more retaining arm assemblies **508** may be attached to the top end portion **552**, such that the one or more retaining arm assemblies **508** extend downwards from the top end portion **552** towards the bottom end portion **550** of the holder body **502**.

(82) According to one aspect of the present disclosure, such as that illustrated in FIG. **11**, the one or more retaining arm assemblies **508** can further include a roller **554** disposed at the free end portion **514** of the retaining arms **510**. The roller **554** can engage with a mobile device as the mobile device is inserted into the adjustable enclosure **506** of the mobile device holder **500**, and guide the mobile device towards a center portion of the adjustable enclosure **506**. It will be appreciated that, while the one or more retaining arm assemblies **508** can include one or more rollers **554** as shown in FIG. **11**, the one or more retaining arm assemblies **508** can also include one or more guiderails **556** positioned at the free end portion **514** of the retaining arms **510**, as shown in FIG. **12**. It will be appreciated that the one or more guiderails **556** can be included in addition to or in lieu of the rollers **554**.

(83) Thus, it is seen that the apparatus and methods of the present disclosure readily achieve the ends and advantages mentioned as well as those inherent therein. While certain preferred embodiments of the disclosure have been illustrated and described for present purposes, numerous changes in the arrangement and construction of parts and steps may be made by those skilled in the art, which changes are encompassed within the scope and spirit of the present disclosure as defined by the appended claims. Each disclosed feature or embodiment may be combined with any of the other disclosed features or embodiments.

Claims

1. A self-adjusting mobile device holder comprising: a holder body; a bottom support bracket having a bottom portion extending in a forward direction from a lower portion of the holder body; a first retaining arm assembly including a first retaining arm and a first gripper portion connected to the first retaining arm; and a second retaining arm assembly including a second retaining arm and a second gripper portion connected to the second retaining arm, wherein the holder body, the bottom support bracket, and the first and second retaining arm assemblies together at least partially define an adjustable enclosure for receiving a mobile device; wherein the first and second retaining arms are connected to opposite lateral sides of the holder body so that the first and second retaining arms can be moved laterally away from and toward each other to adjust a width of the enclosure; and wherein the first and second gripper portions are connected to the first and second retaining arms, respectively, so that the first and second gripper portions can be moved in a forward direction away from the holder body to adjust a depth of the enclosure to receive the mobile device in the enclosure or to release the mobile device from the enclosure.
2. The self-adjusting mobile device holder of claim 1, wherein: the first and second retaining arms each include a mounting end portion pivotally connected to the holder body so that the first and second retaining arms are pivotable relative to the holder body around first and second pivot axes, respectively.
3. The self-adjusting mobile device holder of claim 2, wherein: the first and second pivot axes are parallel to each other.
4. The self-adjusting mobile device holder of claim 2, wherein: the first and second gripper portions are pivotally connected to the first and second retaining arms, respectively, so that the first and second gripper portions are pivotable relative to the first and second retaining arms around third and fourth pivot axes, respectively.
5. The self-adjusting mobile device holder of claim 4, wherein the first and second gripper portions comprise a receiver portion that extends away from the third and fourth pivot axes.
6. The self-adjusting mobile device holder of claim 4, wherein: the third and fourth pivot axes are transverse to the first and second pivot axes, respectively.
7. The self-adjusting mobile device holder of claim 4, further comprising: first and second retaining arm biasing springs biasing the first and second retaining arms laterally toward each other.
8. The self-adjusting mobile device holder of claim 7, further comprising: first and second gripper portion biasing springs biasing the first and second gripper portions rearward toward the holder body.
9. The self-adjusting mobile device holder of claim 1, wherein: the first and second retaining arms are resiliently biased toward each other.
10. The self-adjusting mobile device holder of claim 1, further comprising: a roller disposed at a free end portion of each of the first and second retaining arms.
11. A mobile device holder comprising: a holder body at least partially defining an adjustable enclosure; and an adjustable retaining device configured to retain a mobile device in the adjustable enclosure; wherein the adjustable retaining device is movable from an undeflected state to a deflected state to adjust a size of the enclosure and admit the mobile device to the adjustable

enclosure and resiliently biased to automatically return from the deflected state to the undeflected state when the mobile device is removed from the adjustable enclosure, and wherein the adjustable retaining device is movable relative to the holder body in at least a first direction and a second direction transverse to the first direction.

12. The mobile device holder of claim 11, wherein when the mobile device is introduced to the adjustable enclosure, the mobile device engages the retaining device and causes the retaining device to move from the undeflected state to the deflected state.

13. The mobile device holder of claim 11, wherein the adjustable enclosure is open at a top end, and can receive a mobile device that is introduced through the open top end and, wherein, when the mobile device is received by the enclosure, the mobile device is secured along at least a side portion by the adjustable retaining device.

14. The mobile device holder of claim 11, wherein the adjustable retaining device comprises a first retaining arm pivotally coupled to the holder body at a bottom end portion and a second retaining arm pivotally coupled to the holder body at the bottom end portion, and wherein the first retaining arm is rotationally movable in a first direction by pivoting about a first rotation axis extending along a thickness of the mobile device holder, and the second retaining arm is rotationally movable in a second direction opposite to the first direction by pivoting about a second rotation axis parallel to the first rotation axis.

15. The mobile device holder of claim 14, further comprising a first biasing element disposed between the retaining arm and the holder body and configured to return the retaining device to the undeflected state when no mobile device is within the enclosure.

16. The mobile device holder of claim 14, wherein the first retaining arm comprises a first gear portion and the second retaining arm comprises a second gear portion engaged with the first gear portion such that a rotational movement of the first retaining arm causes a corresponding rotational movement of the second retaining arm and a rotational movement of the second retaining arm causes a corresponding rotational movement of the first retaining arm.

17. The mobile device holder of claim 16, wherein when the adjustable retaining device moves from the undeflected state to the deflected state, the first retaining arm and the second retaining arm move further apart from one another.

18. The mobile device holder of claim 14, wherein the adjustable retaining device further comprises an engagement feature attached to a second end portion of the retaining arm by a hinge and configured to move in the second direction by rotating about a third rotation axis transverse to the first rotation axis.

19. The mobile device holder of claim 18, wherein the engagement feature comprises an angled receiver portion configured to engage a leading edge of the mobile device when the mobile device is introduced to the enclosure, and wherein the engagement between the leading edge of the mobile device and the angled receiver portion causes the engagement feature to rotate about the third rotation axis and away from the holder body.

20. The mobile device holder of claim 18, wherein the adjustable retaining device further comprises a biasing element disposed between the engagement feature and the retaining arm, configured to urge the engagement feature into contact with the holder body when no mobile device is in the enclosure.
