"MODULAR MOUNTING SYSTEM"

BACKGROUND TO THE INVENTION

Field of the Invention

This invention relates to mounting apparatus for an electronic device. More specifically, this invention relates to a modular mounting bracket that is capable of retaining and electrically coupling to different electronic device and to a mechanism for securing a mounting bracket to a surface.

Summary of the Prior Art

The use of brackets to mount cellular telephones, navigation devices and other items in vehicles, for example, is well known. More recently, in-car navigation systems have become more common and a large number of users rely on these systems to assist them in travelling from one destination to another. Many types of navigation systems are available and a number of these systems are interfaced to other in-car systems such as audio speakers, power supplies and an antenna for the provision of satellite data from the Global Positioning System (GPS). Furthermore, some of the navigation systems are also capable of being removed from a vehicle to be used as a portable navigation device enabling a user to navigate from their vehicle to their desired destination.

The majority of mounting systems for portable electronic devices currently available tend to be device specific. This normally requires a user to upgrade their mounting system when they wish to connect different devices onto the mounting system or alternatively, update navigation systems interface capabilities. It would therefore be advantageous to provide a mounting system that is capable of being upgraded rather than requiring replacement when the electronic device is changed.

For use within a vehicle, electronic devices are generally mounted in positions such that the device can be easily viewed and adjusted by either the driver or a front-seat passenger. Typically, portable devices are mounted in positions such as on the windshield or on the dashboard. Hence, due to their mounting location and as a result of vehicle movement, it is necessary to ensure the mounting bracket is capable of holding the electronic device securely without the risk of the device inadvertently falling out of the bracket or the mounting bracket becoming detached. Similarly, when the electronic device is not being used the user may wish to remove the mounting bracket from the vehicle or transfer the device to another

vehicle. Hence, it would be desirable to have a mounting apparatus that is simple to attach to and remove from a vehicle.

A number of portable mounting systems use a suction cup allowing the mounting system to be attached and detached from a window for example. The use of a suction cup provides sufficient suction to hold the mounting system and electronic device in position within the vehicle without the need to penetrate the dashboard for example, using screws. Alternatively, the mounting system can be attached simply and easily to a window. Most suction cup mounting systems include a user-activated lever to create and release the suction cup vacuum. Once the vacuum is released the mounting system is able to fall off the mounting surface. Hence, in order to attach or remove the mounting system, it is generally necessary for a user to use both hands; one to hold the mounting system and one to operate the lever. This can be very inconvenient for the user and there is a risk that the mounting system and/or electronic device could be damaged if the user does not take control of the mounting system when installing it to or removing it from its mounted position.

US5,828,750 to Nokia Mobile Phones Limited discloses a mobile telephone mounting bracket or "rack". The rack has a number of locking points, two of which are spring-loaded. At the top of the rack there is an upper nose, the shape of which corresponds to a cavity in the top end of the mobile telephone. The bottom end of the rack has a guide nose and pair of locking hooks that engage in locking cavities at the bottom end of the mobile phone. To place the mobile phone on the rack, the upper cavity of the mobile phone is pushed onto the rack upper nose. The lower end of the mobile phone is then pressed against a push element mounted within the guide nose at the lower end of the rack that lifts the locking hooks into locking cavities in the bottom end of the mobile phone. To remove the mobile phone from the mounting system, the user must depress two release buttons located adjacent to the locking hooks. This causes the locking hooks to be released enabling the mobile phone to be lifted off the mounting system.

Whilst the upper guide nose should hold the mobile phone on the mounting system until the user depresses the release buttons and lifts up the mobile phone, there is a risk that once the locking hooks are released the mobile phone dislodges from the guide nose and falls away from the mounting system.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a mounting apparatus and/or an electronic device interface mechanism for an electronic device which goes at least

some way to overcoming the abovementioned disadvantages or which at least provides the public with a useful choice.

Accordingly, in a first aspect the invention may broadly be said to consist in a mounting bracket apparatus for attachment to a surface comprising:

a main body having a base and a stem extending from a first side of said base, the base having a depression in a second side opposite to the first side,

a piston movable in the depression in the base,

a suction pad positioned next to the second side of the base and connected to an end of the piston,

an actuation member movable on the stem of the main body, and

a coupling interconnecting the piston and main body,

wherein the entire actuation member is movable relative to the main body and wherein movement of the actuation member in a first direction causes the piston and suction pad to be drawn towards the base member and wherein movement of the actuation member in a second and opposite direction causes the piston and suction pad to move in a direction away from the main body.

Preferably, the stem has a cavity in communication with the base depression wherein an end of the piston is movable within the cavity.

Preferably, a portion of the piston which is housed within the cavity is provided with a laterally extending hole and the side wall or walls of the stem are provided with a correspondingly aligned longitudinal slot such that a pin may be inserted through the slot in the stem and into the hole in the piston to thereby retain the piston to the main body and to also limit relative movement therebetween.

Preferably, biasing means are provided within the cavity to bias the pin towards the end of the slot nearest the base.

Preferably, the coupling comprises at least one lever pivotable about the pin and having a first portion engageable with the actuation member and a camming surface on a second portion engageable with the main body, such that movement of the actuation member in the first direction causes rotation of the at least one lever and the camming surface is shaped so that the pin is further displaced from the base and the piston is retracted further into the cavity upon movement of the actuation member in the first direction.

Preferably, the surface of the base upon which the camming surface of the lever engages includes a detent and the camming surface includes a projection which releaseably locks into position within the detent.

Preferably, the actuation member includes retaining means that retains the first portion of the at least one lever, at least when the piston is in its retracted position, so that movement of the actuation member in the second direction causes rotation of the levers in a direction or directions enabling the pin to return to its biased position at the base end of the slot.

Preferably, the retaining means are disengaged from the at least one lever when the pin is at the base end of the slot.

Preferably, the actuation member comprises a sleeve mounted about and slidable along the stem.

Preferably, at least two levers are located about said stem wherein said at least two levers include portions that interlock.

Preferably, said base is interconnected with said suction pad.

Alternatively, said base is integral with said suction pad.

Preferably, said suction pad has a pair of arms each of which is integral with and extending between the periphery of said suction pad and the coupling.

Preferably, each arm is connected to the first portion of a respective lever.

Preferably, the length of each arm is arranged such that when the pin is away from the base end of the slot the arms are not taut but when the pin is at or approaching the base end of the slot the arms are taut.

Preferably, when said arms are taut they move a section of said suction pad periphery about which said arms are located away from said surface when said arms are released thereby breaking a seal between said suction pad and said surface.

Preferably, two levers are provided which are identical in shape, each being U-shaped having two legs connected about the stem and wherein the pin passes through all four legs, the stem slot and the hole in the piston.

In a second aspect, the invention may broadly be said to consist in an apparatus for holding an electronic device comprising:

a body adapted to support a rear surface of the device and having upper and lower portions,

an upwardly extending projection at the upper portion of the body,

at least two arms extending from said lower portion of the body and adapted to support a lower surface of the device,

a dismounting latch pivotably attached to said upper portion having an engaging member movable towards and away from the rear of the device, and

a resilient latch located on each said arm,

wherein said electronic device has a downwardly directed recess in its rear surface which mates with said upwardly extending projection and downwardly directed recesses in its lower surface which receive said resilient latches on said arms to lock said electronic device to said apparatus and wherein when said dismounting pivotable latch is activated said device remains supported by said upwardly extending projection.

Preferably the dismounting latch is biased away from the body so that the engaging member extends towards the rear of the device in use.

Preferably, the arms project substantially perpendicularly from the body.

Preferably, each of said arms has a lip extending along a portion of an inner surface of each of said arms.

Preferably, said lips are used to locate an equipment interface connector to said arms.

Preferably, said upper extending projection is formed by a plurality of tangs which locate in the recess on in the rear surface at the electronic device.

Preferably, said electronic device is rotatable about said upper extending projection when said electronic device is located on said projection, and said resilient latches are deflectable downwardly so that the base of the device may slide onto the arms.

In a third aspect the invention may broadly be said to consist in an electronic device mounting bracket assembly for mounting an electronic device to a surface comprising:

a mounting bracket attachable to said surface using a suction mechanism,

an equipment cradle securely coupled to said mounting bracket, and

an electrical interface mechanism mounted to said equipment cradle and which receives electronic signals destined for the electronic device,

wherein said electrical interface mechanism is in electrical connection with said electronic device when said electronic device is mounted to said equipment cradle and said suction mechanism enables a user to mount said electronic device mounting bracket assembly to said surface using only one hand.

Preferably, the mounting bracket includes a body and a grasping portion adapted to be gripped by a user's hand wherein the grasping portion is movable such that subsequent to the suction mechanism contacting the surface, further movement of the grasping portion relative to the body causes the suction mechanism to be activated.

Preferably, the further movement of the grasping portion which causes activation of the suction mechanism is rectilinear motion towards the surface or a twisting motion.

Preferably, said electrical interface mechanism is produced in a plurality of connection arrangements, each of which are interchangeably mountable to said equipment cradle.

This invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more of said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

BRIEF DESCRIPTION OF THE DRAWINGS

One preferred form of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a navigation device mounted on the mounting apparatus according to a preferred form of the invention,

Figure 2 is a perspective view of a mounting apparatus of Figure 1 with the navigation device removed.

Figure 3 is an exploded view of a mounting bracket according to a preferred form of the invention,

Figure 4 is a cross-sectional view of the mounting bracket of Figure 1,

Figure 5 is an exploded view of a mounting cradle adapted to be attached to the mounting bracket of Figure 3,

Figure 6 is and exploded view of the hot shoe of that is adapted to be attached to the cradle of Figure 5,

Figure 7 is a rear view of the back of a navigation device of Figure 1,

Figure 8 is plan view of a navigation device of Figure 1, and

Figure 9 is a view of the bottom of the navigation device of Figure 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to Figure 1 the present invention provides a mounting apparatus 1 for mounting an electronic device 5. The mounting apparatus 1 is capable of retaining and electrically connecting to different electronic devices 5 having different electrical connector configurations using a standard mounting bracket and by attaching an appropriate interfacing

connector 3 to the mounting apparatus 1 in order to provide an appropriate external interface capability to the electronic device 5.

Single Action Suction Cup Mounting System

In a first aspect the present invention overcomes the requirement for a user to use both hands when installing or removing a mounting bracket from a vehicle surface. In another aspect, the invention enables the equipment, such as a vehicle navigation system, to remain supported by the bracket after disengagement. A suction cup mount mechanism 2 which is able to be activated by a user with one hand, having an outer housing 10 interconnected with a main body portion 12 to effect attachment and release of the mounting bracket system 1 to a surface. The suction cup mounting system 2 is made up of a number of components enclosed within and interconnected with the outer housing 10 such that each item in the mounting assembly interacts to provide a simplified mounting system.

Figures 2 to 4 show the mounting bracket assembly 1 of the present invention which comprises a main body portion 12, an equipment cradle 14 and a hot shoe interface plate 3 attached to the bottom of the cradle 4. Although a detailed explanation of the invention is given below briefly, the main body portion 12 has a suction pad 14 attached to the bottom of the main body base 16 which enables the mounting bracket assembly 1 to be attached to a surface when a user places the suction pad 14 against a surface and moves the outer housing 10 towards the base 16. The equipment cradle 14 has a number of latches 160, 162, 164 which engage with a number of catches 400, 402, 404 located on the electronic device 5 to be mounted on the cradle 4 in order to securely retain the device on the cradle 4. Furthermore, a hot shoe connector 3 can be attached to the bottom of the cradle 4 to enable data from systems external to the electronic device 5 to be input into the device 5.

The suction cup mounting bracket assembly 2 comprises a main body portion 12 having a base 16 and a stem 18 that extends from the base 16. Preferably the base 16 and stem 18 are formed from a rigid plastics type material such as polycarbonate or other thermo-set type of material known in the art. At the distal end of the stem 18 is a ball joint 20 which enables the connection of the suction cup mounting bracket assembly 2 to a cradle 4 that has a complementary socket connection 50 used to hold a device 5 to the bracket assembly 2. The underside of the base 16 is adapted for connection to a surface and includes a raised peripheral lip 22 and hollowed central region 24. Each of the elements forming part of the suction cup mounting bracket assembly 2 are preferably coaxially aligned about the stem 18 and enclosed within an outer housing 10 which is also interconnected to move levers 26, 28

pivotally connected to the stem 18. When the outer housing 10 is moved towards the main body base 16, due to the interaction of each of the elements interconnected to the stem 18, a vacuum is created between the surface to which the mounting bracket assembly 2 is being attached and the suction pad 14 attached at the bottom of the main body base 16. Furthermore, to remove the bracket 2 from the surface a user merely has to apply a force to the outer housing 10 in the direction away from the surface to which the bracket 2 is attached. This action causes the vacuum to be released enabling the assembly to be removed from the surface. Although the above description refers to the outer housing 2 being moved only rectilinearly towards or away from the surface, it will be appreciated that a rotational or screw-like movement could alternatively be employed or linear motion in another direction.

As the assembly comprises a number of interacting elements, each element is described separately in the following sections.

Suction Pad

With reference to Figure 3, the suction pad 14 has a circular base pad 30 with a pair of arms 32, 34 integral with and extending from the periphery of the upper surface of the base 30. The arms 32, 34 are located equidistant about the base and both the suction pad and arms are made from a flexible plastics material such as acrylic or any rubber based type of material known in the art which is constructed using a moulding or extruding process. At the end of each arm 32, 34 is a rounded T-piece 36, 38. Located below and in close proximity to each T-piece 36, 38 is a further widened or trapezoidal shaped section 38, 40 extending from each side of each arm 32, 34. This configuration creates an indent between the head of the T-piece 36, 38 and trapezoidal sections 38, 40 at the distal end of each arm 32, 34 and is used to rotatably attach each suction pad arm 32, 34 to a corresponding lever 36, 28 that is pivotally connected to the main body stem 18.

Whilst each suction pad arm 32, 34 extends upwards at an angle from the base 30 upper surface, each arm 32, 34 is shaped or bent such that it has a downward step or kink 42, 44 approximately half way along each arm 32, 34. This allows the arms 32, 34, in use, to assume a predictable orientation when depressed onto the main body base 16 when the outer housing 10 is depressed in a direction towards the base 16.

Central to the upper surface of the suction pad 14 is an opening 46 into which the base 48 of a post or piston 50 is located. The base 48 is incorporated into the suction pad upper surface opening 46 during the extruding or moulding of the suction pad 14. The post 50 extends perpendicularly to and upwards from the suction pad upper surface 30 and has a

spring 52 located between its upper or distal end and the upper end of a cavity formed within the hollow main body stem 24. Located towards the distal end of the post is a laterally extending hole 54. This allows for the interconnection of the suction pad 14 and post 50 with the main body stem 18 using an interconnecting pin 56. The pin 56 passes through vertically arranged slots 58 in either side of the stem 18 thereby locking the spring loaded post 50 and suction pad 14 to the main body stem 18. The pin 56 is also used to interconnect a pair of levers 26, 28 (described below) to the main body stem 18 thereby forming a suction pad assembly.

Levers

Figures 3 and 4 show a pair of identical levers 26, 28 formed from a plastics material such as polycarbonate or other thermo-set type of material known in the art, using a moulding or extruding process. Each of the levers 26, 28 has a pair of lever arms 70, 72 connected at the end to form a "U" shape enabling the levers 26, 28 to be pivotally connected to the main body stem 18 by the aforementioned pin 56 extending through each lever arm opening 74, 76 and the stem 18. Although two levers 26, 28 are shown, it is understood that a single lever could be sufficient. Each lever arm 70, 72 has a circular opening 74, 76 towards its distal end, oriented perpendicular to the plane of the arm 70, 72. One arm 70 has a large circular opening 74 while the other arm 72 has a small circular opening 76. The smaller circular opening 76 has a lip 78 extending outwards around the circumference of the shorter arm opening 76.

The levers 26, 28 are located opposite each other on either side of the main body stem 18 such that the large opening 74 on one lever 26 interlocks with the lip 78 extending around the periphery of the small opening 76 on the other lever 28 and visa versa. Hence, once the pin 56 is inserted, each lever arm 70, 72 is interlocked into position about the main body stem 18 and positioned such that each of the lever arm openings 74, 76 are in alignment with the hole 58 extending through the main body stem 18.

Interconnecting and integral with each of the lever arms 70, 72 is a rounded bar section 80. Extending inwards from each lever arm 70,72, just below the rounded bar section 80 are a pair of supporting members 82, 84. These supports 82, 84 have a curved shape such that they complement the rounded head of the T-piece 36, 38 at the distal end of each suction pad arm 32, 34 thereby enabling the suction pad arms 32, 34 to be attached to each lever 26, 28. When the suction pad arm 32, 34 is engaged with the lever 26, 28, the trapezoidal section 38, 40 of each suction pad arm 32, 34 abuts the underside of each curved support 82, 84. The

head of the T-piece 36, 38 is capable of rotating in the trough formed between the rounded bar sections. This suction pad arm connection system enables the suction pad arms 32, 34 to move with respect to the levers 26, 28 when they are depressed or released.

On the end of each lever arm closest 70, 72 to the pin, a shaped camming surface 86, 88 is provided. The shaped camming surface 86, 88 engages with a flat camming surface 90, 92 on the base 16. The shaped camming surface 86, 88 is shaped so that the lever arms 70, 72 are rotated down towards the base 16, the distance between the pin 56 and base 16 is increased, drawing the piston 50 into the cavity 24 in the stem 18, against the biasing fence of the spring 152. A projection on the shaped camming surface 86, 88 engages with a complementary channel 94, 96 located on the body's flat camming surface 90, 92 to lock the levers 26, 28 into a position when the levers 26, 28 are fully lowered to enable a vacuum to be maintained between the suction pad 14 and the surface to which the mounting bracket assembly 2 is attached. When the user raises the outer housing 10, the projections are disengaged from the channels 94, 96 enabling the levers 26, 28 to be moved into a raised position thereby releasing the vacuum between the suction pad 14 and the surface. When the levers 26, 28 approach or reach their upper positions, the arms 32, 34 of the suction pad 14 become slightly taut thereby breaking the seal.

Main Body

With reference to Figures 3 and 4, the mounting bracket main body 12 comprises a base 16 and a stem of single piece construction whereby the base is the same or slightly smaller than diameter as the suction pad 14. The base 16 curves upwards to provide a raised central portion 22 from which the stem 18 protrudes perpendicularly. The end of the stem 18 distal to the base 16 tapers at an angle of between 45 and 60 degrees and carries a ball forming part of a ball joint 20 onto which a cradle 14 or other equipment bracket can be attached.

The stem 18 is generally oval in cross-section and has two flat cut-away sections 100,102 located opposite each other and extending upwards a distance from the base 16. At the top of each cut-away section a lip 104, 106 is formed which engages with a complementary catch 108, 110 located on the underside of the outer housing 10. This is used to limit the movement of the outer housing 2 in the vertical direction when the outer housing 10 is in the raised position.

Towards the periphery of the base are a pair of lugs 112, 114 extending vertically from the base 16. These lugs 112, 114 are located opposite each other about the stem 18 and

are positioned such that the downward step 42, 44 of each suction pad arm 32, 34 is forced toward the bottom inside edge of each lug 112, 114 by a complementary protrusion 116, 118 on the interior cavity of the outer housing 10 when the outer housing 10 is depressed. Hence, the suction pad arms 32, 34 are placed into a in predictable orientation when the outer housing 10 moves towards the base 16 and the space between the base 16 and outer housing 10 is limited.

In order to avoid the possibility of relative rotation between the outer housing 10 and base 16, a pair of projections 120, 122 are located at 90° to each of the lugs 112, 114 on the base 16. These projections 120, 122 extend from the periphery of the base 16 towards the raised surface 22 towards the base of the stem 18 such that the top surface of each projection 120, 122 lies in a plane parallel to the base 16. A complementary pair of projections (not shown) are located on the interior cavity of the outer housing 10 such that the projections are in abutment when the outer housing 10 is in a lowered position.

Outer Housing

In order to provide a mounting bracket clamping and release mechanism that enables a user to mount and dismount the bracket 2 from a vehicle surface using one hand only, the assembly of the present invention is operated by an outer housing 10 as shown in Figures 3 and 4. The outer housing 10 has an elongated opening 130 extending through its centre enabling it to be slid over the ball-joint 20 and onto the stem 18. The interior surface of the outer housing 10 is a hollow concave shape forming a brim 132 and having an elongate hollow raised portion 134 extending from the brim 132. A gripping portion 136 is provided at each end of the elongate raised portion 134 which consists of detents large enough to comfortably enable a user to grip the elongated raised portion 134 using a thumb and forefinger for example.

Extending vertically downwards into the interior of the outer housing 10 are a pair of a resilient catches 108, 110 located opposite each other which engage with the complementary lips 104, 106 on either side of the base of the stem 18 in order to retain the outer housing 10 on the stem 18 whilst allowing the outer housing 10 to be moved up and down the stem 18 by a user.

Located below and horizontally offset from the resilient catches 108, 110 are C-shaped recesses 138, 140 formed at the position where the elongated raised portion 134 and brim 132 meet. Both C-shaped recesses 138, 140 are oriented such that their open sides face toward the centre of the outer housing interior. The bottom portion 142, 144 of the C-shaped

section 138, 140 is formed from a wedge shaped ledge extending from the interior brim section 134. The bottom portion of the wedge 116, 118 engages with the downward step 42, 44 of each suction arm 32, 34 when the outer housing 10 is forced toward the main body base 16. The rounded bar portion of each lever engages within each respective C-shaped section as the outer housing is moved towards the base when attaching the mounting bracket assembly to a surface. The rounded bar section 80 of each lever 26, 28 contacts the top of its C-shaped section 138, 140 and is thereby urged downwards towards the base 16 as the outer housing 10 is moved towards the base 16. When the outer housing 10 is fully depressed towards the base 16, the rounded bar sections 80 of each lever 26, 28 are deployed outwardly to their full extent and are thus fully engaged within the C-shaped sections 138, 140. Thus, when a user grasps the outer housing 10 and pulls it away from the base 16, it also lifts the distal ends of the levers 26, 28 which rotate about the pin 56 to lower the piston 50 and release the vacuum in the suction cup 14.

Mounting Bracket Assembly Operation

The suction pad 14 is placed on a surface to which the mounting bracket assembly 2 is to be connected such that the suction pad 30 lies flat on the surface. In order to create a vacuum between the suction pad 30 and the surface, the user applies a pressure on the outer housing 10 using for example two digits, such as the thumb and fore-finger, in order to force the outer housing 10 down the main body stem 18 and towards the main body base 16. The force applied to the outer housing 10 causes the outer housing 10 to move and also causes the levers 26, 28 attached to the C-shaped sections 138, 140 to pivot about the pin 56 through the stem 18 thereby forcing the rounded bar sections 80 towards the base 16 and until the projection 86, 88 on each lever arm 26, 28 engages with the channels 94, 96 on the base raised platform 90, 92 thereby locking the outer housing 10 and levers 26, 28 in a "locked" position. As the levers 26, 28 and post 50 are both interconnected to the stem 18, as a result of the lever pivoting action the piston 50 is drawn into the hollow stem 24, compressing the spring 52. As the piston 50 is moved in a direction away from the base 16 and due to the interconnection of the suction pad 30 and the piston 50, the central section of the suction pad 30 is forced to move in the same direction such that the suction pad 30 becomes concave thereby creating a vacuum between the suction pad 30and the surface.

In order to remove the mounting bracket assembly 2 from a surface the user merely has to pull the outer housing 10 in a direction away from the main body base 16. This causes the projections 86, 88 on the levers 26, 28 to disengage the channels 94, 96 in the raised

surface of the base 22 enabling the projections 86, 88 to slide across the platform surface 90, 92 as the levers 26, 28 are pivoted upwards and away from the base 16. At the same time the piston 50 moves back down the stem cavity 24 enabling the suction pad 30 to flatten thereby releasing the vacuum. In order to break the suction of the pad 30 against the surface, as previously mentioned, the arms 32, 34 of the pad 14 cause the edges of the pad to be deformed very slightly once the outer housing 10 is fully withdrawn. Once the suction pad 30 becomes convex in shape, the mounting bracket 2 can be easily removed from the surface.

Equipment Cradle

Most equipment mounting brackets are integral with the mounting system and use clips to locate and lock a device onto the bracket. In a large number of cases two hands are required to mount or dismount the device from the bracket as once the release mechanism is operated (using a button or lever), the device will have a tendency to fall off the bracket. This is overcome with the present invention as shown in Figure 5. An equipment cradle 4 is provided with a top hook system 164, two resilient latches 162 on a pair of cradle arms 166 and a spring loaded latching mechanism 160. With reference to Figures 7 to 9, the electronic device 5 has a number of depressions in the rear 402 and bottom 404 of the device 5 which are in alignment with and complement each of the of the cradle holding mechanism positions plus a pair of openings 400 on the top surface of the device 5.

In the preferred embodiment, the top hook comprises a pair of tangs 164 each of which extend from the top of the cradle 4 in the vertical direction. Each of the tangs 164, in use, locate into a complementary openings 400 on the top surface of the device 5 such that the user can both see and feel that the top hooks 164 are correctly engaged with the device openings 400. The tangs 164 are separated in the horizontal direction by a gap 166 such that the top hook 164 fill the corresponding openings 400 on the device 5. Hence, once the top hook 64 are engaged in the complimentary openings 400, the device 5 will be held on the cradle 4 enabling the user to rotate the device 5 toward the front surface of the cradle 168. Further, whilst it is preferred to have a top hook having a pair of tangs 164, it is also possible to provide a top hook having a larger number of tangs or alternatively a single upwardly extending hook.

Once the device is located on the top hook 164, the device 5 is rotated towards the cradle front surface 168 such that the bottom surface 406 of the device 5 begins to abut the cradle arms 166. During this process, a spring loaded latch arm 60 engages a complementary recess 402 in the rear of the device 5. As the device 5 is rotated further, the latch arm 60 also

rotates in a downward direction about a pivot pin 170 and locks the device 5 against the cradle 4 once the back of the device 5 comes into contact with the front surface of the cradle 168. The latch arm 60 holds the device 5 against the cradle 4 and at the same time prevents the device 5 from moving in a vertical direction and off the cradle 4 if the device 5 and mounting system 2 is subject to shocks, for example, when the vehicle is travelling on an uneven surface.

At the bottom of the cradle is a pair of arms 166 projecting horizontally from the cradle front surface 168. Each arm 166 has an upwardly projecting resilient latch 162 located toward the distal end of each arm 168 as shown in Figure 3. As the device 5 has a pair of complementary catches 404 recessed on the bottom of the device 5, when the device 5 is placed on the top hook 164 and rotated towards the cradle front surface 168, the bottom of the device 406 abuts the cradle arms 166 and continues to slid across the surface of the arms 166 until the resilient latches 62 engage with the complementary catches 404 on the bottom of the device 5. The engagement of the resilient latches 162 with their complementary catches 404 provides an anti-vibration feature thereby preventing any movement of the device 5 in the horizontal direction.

The underside of each arm (not shown) is cut-away to form an inverted U-shaped channel to provide an area into which the resilient latches 162 can move when a depressive force is applied to the latches 162 when the device 5 is being attached to or removed from the cradle 4. On the internal side surface of each arm 166 is a projection 172 which extends a short distance from the front surface 174 of each arm 166 and towards the rear of the arms 166 where the arms 166 are integral with the cradle front surface 168. These projections 172 are positioned such that they are opposite each other on the respective arms 168 and are used to locate a complementary indent 300 n a hot shoe 3 thereby providing a stop when the hot shoe 3 is slid onto the cradle 4.

The cradle body front surface 168 has a concavity 176 extending from the front surface 168 towards the mounting bracket socket connection 50 forming a cradle mounting arm 178. The apex of the cavity (not shown) is closed and shaped to form a rounded socket portion. Towards the end of the cradle mounting arm 178 is a threaded tubular portion 180 and associated mounting nut 182 forming a socket connection 50. The cradle 4 can be mounted onto a mounting bracket 2 detailed above by inserting the mounting bracket ball-joint 20 into the socket 50 and once in position, the mounting nut 182 is rotated towards the cradle 4. As the nut 182 has a conical thread, as the nut 182 is turned a radially concentric force is applied to the threaded tubular portion 180 causing the tubular section 180 to close

and grip the ball joint 20. This enables the ball joint 20 to move with respect to the socket connection 50 whilst preventing the cradle 4 from disengaging the mounting bracket arrangement 2. Hence, when the mounting bracket 2 is attached to a surface within the vehicle such as the windscreen, the cradle 4 can be moved into a position enabling the user to view the device 5.

To release a device 5 from the cradle 4 the user depresses the spring loaded lever 184 towards the device 5 thereby causing the spring loaded latch 160 to disengage from the complementary recess 402 in the rear of the device 5. This allows the user to release cradle arm latches 162 from the catches 404 on the bottom of the device 5 enabling the device 5 to be removed from the cradle arms 166 by sliding the bottom of the device 406 across the cradle arms 166. This sliding force causes the resilient arm latches 162 to disengage with the complementary indents 404 on the bottom 406 of the device 5 thereby releasing the base 406 of the device 5. This enables a user to rotate the device 5 about the top hooks 164 allowing the user to lift the device 5 off the top hooks 164 and away from the cradle 4. Hence, the device 5 will remain on the cradle 4 even when the spring loaded latch 160 and cradle arm resilient latches 162 have been released as the top hooks 164 remaining engaged in the complementary openings 400 on the top surface of the device 5.

Modular Mounting System

Figure 2 shows the cradle 4 attached to the mounting bracket assembly 2 of the present invention. In this configuration the mounting system is capable of having a hot shoe 3 slideably connected onto the cradle arms 166 in order to provide specific interface functionality for a device 5 on the mounting bracket. Alternatively, the hot shoe 3 may be clipped or attached by a snap-on connection to the cradle 4. Preferably, the hot shoe 3 slides onto the cradle arms 166 from the rear of the cradle 4 such that the device interface connections 302 lie between the cradle arms 166. Hence, when the device 5, which has a complementary interface connector 408 on the base of the unit 406, is slid onto the cradle arms 166 into a mounted position on the cradle 4, the hot shoe connector 302 and device interface connector 408 mate thereby enabling an electrical connection to be made.

Hot Shoe

When being used in a vehicle, an electronic device is generally mounted onto a modular mounting bracket to hold the device in a position such that it can be viewed by the driver or other occupants of the vehicle. Generally, portable type devices operate independently of the car systems. However, to obtain a more accurate GPS signal and/or

traffic management data for example, the device needs to be connected to fixed in-vehicle systems. This is achieved by either connecting interface cables directly to the device or having interface cables connected to the mounting bracket. Each of these options are problematic in that the cables may be damaged when not connected to a device as they are left "hanging" in the vehicle or if the device is updated or changed thereby requiring different interface connections, it may be necessary to also replace the mounting bracket. These problems can be overcome using a hot shoe as illustrated in Figures 2 and 5.

An electronic circuit board 304 is enclosed within the hot shoe enclosure 306 and has a number of interface connectors 308, 310, 312 protruding from the enclosure 306 which are electrically connected to the circuit board 304. One side of the enclosure has a power 308 and an audio connector 310 whilst at the opposite side of the enclosure 306 has a traffic management antenna input connector 312. Other connector inputs may be provided such as GPS data or alternatively, the hot shoe 3 may be provided with only a power 308 and audio input connector 310 or any other combination of connectors depending on the operational requirements of the device 5. These connectors 308, 310 312 are used to interface the hot shoe 3 and a device 5, when it is placed on the hot shoe 3, to external systems permanently attached to the vehicle.

Protruding from the upper surface of the hot shoe 3 is an interface connector 302 which is in electrical connection with the circuit board 304. This interface connector 302 is used to mate with a complementary connector 408 on the base 406 of an electronic device 5 when the device 5 is connected to the hot shoe 3. Hence, data is fed from the interface connectors 308, 310, 312 via the circuit board 304 and output to the device interface connector 408 via the hot shoe interface connector 302.

The hot shoe 3 modular design enables a user to upgrade their device 5 without the need to replace the mounting bracket system 1 in their vehicle. Depending on the new device requirements, a user may only have to purchase a new hot shoe 3 to enable the fixed in-car systems to be interfaced with the new device 5. Hence, each hot shoe 3 is of the same shape and size such as that illustrated in Figure 6, the only difference being the requirement to have different external port input connections and/or different device interface connections.

When the hot shoe 3 is being slid onto the cradle 4 from the rear of the cradle arms 166, the hot shoe interface contacts 302 are wiped by a pad (not shown) located on the base of the cradle 4. Hence, each time the hot shoe 3 is attached to the cradle 4, the interface contacts 302 are cleaned thereby enabling a clean contact to be made between the hot shoe contacts 302 and device interface connector 408.

The hot shoe 3 has a resilient lug 314 extending from the upper surface of the hot shoe enclosure 306 which locates in a cut-out section 316 located towards the base of the cradle cavity 176 enabling the hot shoe 3 to be clipped to the cradle 4. In order to remove the hot shoe 3 from the cradle 4, the user must depress the hot shoe lug 314 in order to disengage the lug 314 from the complimentary catch 318 arrangement in the cradle cavity 316 enabling the user to then slide the hot shoe 3 backwards and off the cradle arms 166. Whilst the hot shoe 3 is removeable from the cradle 4 it is preferable to leave it permanently attached to the cradle 4 enabling the user to attach and remove the device 5 from the vehicle if desired.

In order to slidably mount the hot shoe 3 to the cradle arms 166 the upper surface of the hot shoe enclosure 306 has approximately half of the upper surface removed such that the front half of the hot shoe upper surface is stepped to a level lower 320 than the rear half of the upper surface. The lower level has the hot shoe interface connector 302 protruding from the lower level upper surface 320 enabling an electronic device 5 to interface with the hot shoe connector 302. Towards either side of the lower level is a pair cut away 322 areas each of which decline from the step 324 towards the front of the hot shoe 3. A lip (not shown) surrounds the front and outer edge of each cut away area 322 which engages with a complementary groove (not shown) in the bottom surface of each cradle arm 166. Extending from hot shoe upper surface is a pair of resilient latches 326 provided either side of the resilient lug 314. These lugs 314 engage with complimentary catches (not shown) located within the cavity 316 to lock the hot shoe on to the cradle 4.

The hot shoe 3 is mounted on the cradle 4 from the back of the cradle 4 such that the hot shoe cut away areas 322 slid along the cradle arms 166. The user continues to push the hot shoe 3 onto the cradle arms 166 until a "click" is heard whereby the resilient latching members 326 engage with their complimentary catches (not shown) on the cradle 4 and the resilient button 314 protrudes from the cradle cut-away area 316. In this position the hot shoe 3 is firmly locked into position on the cradle 4.

To remove the hot shoe 3 from the cradle 4, the user applies a positive force towards the hot shoe upper surface 320 thereby depressing the resilient button 314 in order to disengage the latch members 326 from their complementary catches (not shown) thereby enabling the user to slide the hot shoe 3 backwards towards the rear of the cradle arms 166 and off the cradle 4.

Hence, the modular configuration of the mounting bracket system of the present invention provides an attachment mechanism for an electronic device that is simple to use and operate by a user whilst providing for an interface system that enables a user to upgrade the

equipment to be attached to the cradle system without need to simultaneously upgrade the entire mounting system.

CLAIMS

1. A mounting bracket apparatus for attachment to a surface comprising:

a main body having a base and a stem extending from a first side of said base, the base having a depression in a second side opposite to the first side,

a piston movable in the depression in the base,

a suction pad positioned next to the second side of the base and connected to an end of the piston,

an actuation member movable on the stem of the main body, and

a coupling interconnecting the piston and main body,

wherein the entire actuation member is movable relative to the main body and wherein movement of the actuation member in a first direction causes the piston and suction pad to be drawn towards the base member and wherein movement of the actuation member in a second and opposite direction causes the piston and suction pad to move in a direction away from the main body.

2. A mounting bracket apparatus according to claim 1 wherein the stem has a cavity in communication with the base depression wherein an end of the piston is movable within the cavity.

3. A mounting bracket apparatus according to claim 1 or claim 2 wherein a portion of the piston which is housed within the cavity is provided with a laterally extending hole and the side wall or walls of the stem are provided with a correspondingly aligned longitudinal slot such that a pin may be inserted through the slot in the stem and into the hole in the piston to thereby retain the piston to the main body and to also limit relative movement therebetween.

4. A mounting bracket apparatus according to claim 2 wherein biasing means are provided within the cavity to bias the pin towards the end of the slot nearest the base.

5. A mounting bracket apparatus according to claim 3 wherein the coupling comprises at least one lever pivotable about the pin and having a first portion engageable with the actuation member and a camming surface on a second portion engageable with the main body, such that movement of the actuation member in the first direction causes rotation of the at

least one lever and the camming surface is shaped so that the pin is further displaced from the base and the piston is retracted further into the cavity upon movement of the actuation member in the first direction.

6. A mounting bracket apparatus according to claim 5 wherein the surface of the base upon which the camming surface of the lever engages includes a detent and the camming surface includes a projection which releaseably locks into position within the detent.

7. A mounting bracket apparatus according to claim 5 or claim 6 wherein the actuation member includes retaining means that retains the first portion of the at least one lever, at least when the piston is in its retracted position, so that movement of the actuation member in the second direction causes rotation of the levers in a direction or directions enabling the pin to return to its biased position at the base end of the slot.

8. A mounting bracket apparatus according to claim 7 wherein the retaining means are disengaged from the at least one lever when the pin is at the base end of the slot.

9. A mounting bracket apparatus according to any one of the proceeding claims wherein the actuation member comprises a sleeve mounted about and slidable along the stem.

10. A mounting bracket apparatus according to any one of claims 5 to 8 wherein at least two levers are located about said stem wherein said at least two levers include portions that interlock.

11. A mounting bracket apparatus according to any one of the previous claims wherein said base is interconnected with said suction pad.

12. A mounting bracket apparatus according to any one of claims 1 to 10 wherein said base is integral with said suction pad.

13. A mounting bracket apparatus according to any one of the previous claims wherein said suction pad has a pair of arms each of which is integral with and extending between the periphery of said suction pad and the coupling.

14. A mounting bracket apparatus according to claim 13 wherein each arm is connected to the first portion of a respective lever.

15. A mounting bracket apparatus according to any one of claims 13 or claim 14 when dependent on claim 3 wherein the length of each arm is arranged such that when the pin is away from the base end of the slot the arms are not taut but when the pin is at or approaching the base end of the slot the arms are taut.

16. A mounting bracket apparatus according to any one of claims 13 to 15 wherein when said arms are taut they move a section of said suction pad periphery about which said arms are located away from said surface when said arms are released thereby breaking a seal between said suction pad and said surface.

17. A mounting bracket apparatus according to claim 5 wherein two levers are provided which are identical in shape, each being U-shaped having two legs connected about the stem and wherein the pin passes through all four legs, the stem slot and the hole in the piston.

18. An apparatus for holding an electronic device comprising:

a body adapted to support a rear surface of the device and having upper and lower portions,

an upwardly extending projection at the upper portion of the body,

at least two arms extending from said lower portion of the body and adapted to support a lower surface of the device,

a dismounting latch pivotably attached to said upper portion having an engaging member movable towards and away from the rear of the device, and

a resilient latch located on each said arm,

wherein said electronic device has a downwardly directed recess in its rear surface which mates with said upwardly extending projection and downwardly directed recesses in its lower surface which receive said resilient latches on said arms to lock said electronic device to said apparatus and wherein when said dismounting pivotable latch is activated said device remains supported by said upwardly extending projection.

19. An apparatus for holding an electronic device according to claim 18 wherein the dismounting latch is biased away from the body so that the engaging member extends towards the rear of the device in use.

20. An apparatus for holding an electronic device according to claim 18 or claim 19 wherein the arms project substantially perpendicularly from the body.

21. An apparatus for holding an electronic device according to any one of claims 18 to 20 wherein each of said arms have a lip extending along a portion of an inner surface of each of said arms.

22. An apparatus for holding an electronic device according to claim 21 wherein said lips are used to locate an equipment interface connector to said arms.

23. An apparatus for holding an electronic device according to any one of claims 18 to 22 wherein said upwardly extending projection is formed by a plurality of tangs which locate in the recess in the rear surface of the electronic device.

24. An apparatus for holding an electronic device according to any one of claims 18 to 23 wherein said electronic device is rotatable about said upper extending projection when said electronic device is located on said projection, and said resilient latches are deflectable downwardly so that the base of the device may slide onto the arms.

25. An electronic device mounting bracket assembly for mounting an electronic device to a surface comprising:

a mounting bracket attachable to said surface using a suction mechanism,

an equipment cradle securely coupled to said mounting bracket, and

an electrical interface mechanism mounted to said equipment cradle and which receives electronic signals destined for the electronic device,

wherein said electrical interface mechanism is in electrical connection with said electronic device when said electronic device is mounted to said equipment cradle and said suction mechanism enables a user to mount said electronic device mounting bracket assembly to said surface using only one hand.

26. An electronic device mounting bracket assembly according to claim 25 wherein the mounting bracket includes a body and a grasping portion adapted to be gripped by a user's hand wherein the grasping portion is movable such that subsequent to the suction mechanism contacting the surface, further movement of the grasping portion relative to the body causes the suction mechanism to be activated.

27. An electronic device mounting bracket assembly according to claim 26 wherein the further movement of the grasping portion which causes activation of the suction mechanism is rectilinear motion towards the surface or a twisting motion.

28. An electronic device mounting bracket assembly according to any one of claims 25 to 27 wherein said electrical interface mechanism is produced in a plurality of connection arrangements, each of which are interchangeably mountable to said equipment cradle.