

STYLUS RECEPTACLE

This invention relates to a stylus designed primarily for use with a touch
5 screen display. In particular, the invention relates to a stylus receptacle
which, in combination with the stylus, provides for improved storage and
removal of the stylus.

BACKGROUND OF THE INVENTION

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Pen or stylus-operated portable computer devices have been available for a
number of years from such companies as Hewlett-Packard and Apple
Computers of USA and Sharp of Japan. In general, these devices include a
touch screen display for recognising user inputs from a pen or stylus. United
15 States Patent number 5,596,697, for example, describes a portable
computer device which is designed to operate predominantly using a pen-
based input.

European Patent Application number EP 0,766,168 A2 describes another
20 portable computer device which includes, in addition to a touch screen, an
alpha-numeric keyboard for user inputs. This device, like other pen-based
devices, detects pen-based user inputs by responding to pressure applied
by the pen on the touch screen. Accordingly, the pen is not required to be
connected to the device, thus making it easier to manipulate by a user. The
25 pen may be described as being wireless or untethered. Without proper
storage in a receptacle, this untethered pen may be easily lost by a user.

One known example of a pen or stylus receptacle is found in the HP 360 LX
personal organiser available from Hewlett-Packard. This receptacle has an
30 elongate chamber to house the pen. A user wishing to store the pen inserts
it lengthwise into the elongate chamber. An annular constriction in the
chamber engages a groove on the pen which helps to retain the pen in a

predetermined storage position within the chamber. The pen has a lateral surface at one end which is exposed in the storage position to facilitate removal of the pen. A user wishing to remove a stored pen draws the pen out of the chamber by dragging a thumb or finger over the exposed surface.

- 5 The exposed surface is ridged so as to improve the interaction between the user and the pen. There is however a drawback with this design of receptacle. The engagement of the pen in the storage position must not be too strong otherwise a user will experience difficulty in removing the pen from the receptacle. Conversely, the engagement must be strong enough to
10 prevent the pen from being accidentally dislodged during transportation. These two conflicting requirements present practical limitations to a designer of a pen receptacle. In some cases, fine tolerances may be needed between the pen and the engagement mechanism. A typical consequence of these fine tolerances will be increased production times for the device,
15 increased cost in producing the device, and possible weakening of the pen engagement due to ageing of the engagement mechanism and wear of the pen.

- United States Patent number 5,180,891 describes another known example
20 of a pen or stylus receptacle implemented in a digitizer tablet. In this example, the wireless stylus includes a pocket clip having a latch which, upon insertion into a storage compartment within the digitiser, engages a cam. The cam has a shape that causes the latch to move into engagement with a keeper as the stylus is pushed into the compartment and then
25 released. The keeper holds the stylus in a stored position. The latch is released upon first pushing the stylus and then releasing it. Biasing means engage the stylus outwardly from the storage compartment allowing the stylus to be grasped and withdrawn from the tablet. The biasing means, cam and keeper all take up space within the digitiser housing, which is
30 additional to the minimum space needed to store the pen. Consequently, the implementation of this kind of retaining mechanism in a portable computer device has the effect of increasing the volume of the device. This

effect is a problem as it conflicts with the commercial drive to minimise the size of portable computer devices. Other stylus or pen receptacles also have this same problem.

5 SUMMARY OF THE INVENTION

It is an object of the present invention to provide a stylus and receptacle combination for use in a portable computer device, in which the stylus itself is functional to help a user remove the stylus from the receptacle. In particular, the invention provides for a displaceable element on the stylus. The displaceable element is movable, whilst the stylus is stored, to a position which allows a user to gain a grip on the stylus so that it can be removed from the receptacle.

15 A stylus and receptacle combination in accordance with the invention has the advantage that the stylus may be easily withdrawn from the receptacle when desired.

Another advantage of a stylus and receptacle combination in accordance with the invention is that the stylus removal functions may be integrated within the internal space of the stylus. This use of the internal space of the stylus helps reduce space occupied in the receptacle. Thus the stylus and receptacle combination can be implemented in a portable computer device occupying only minimal space.

25 A further advantage of a stylus and receptacle combination in accordance with the invention is that the displaceable element can be movable to a position which extends the overall length of the stylus, which in turn makes the stylus easier to manipulate by a user. Moreover, the displaceable element can be moved to a position which decreases the overall length of the stylus while it is stored in the receptacle.

In a preferred embodiment, the stylus receptacle is designed to positively hold the stylus in the stored position. The body of the stylus may be held firmly by the receptacle in the stored position so that the stylus will not fall out accidentally when it is transported. In this situation, a user will not experience any difficulties in removing the stylus since the invention allows a user to gain a good grip on the stylus during removal. Expressed in another way, a stylus and receptacle combination in accordance with the invention has the advantage that the stylus may be locked more securely, making it less likely to be lost.

Another advantage of a stylus and receptacle combination in accordance with the invention is that it enables time-saving and cost-saving production techniques to be employed. For example, the stylus may be produced separately and in parallel with the receptacle. The extra functionality in the stylus saves on the complexity and hence the production time of the receptacle. The simpler receptacle may be incorporated in a range of portable computer devices which use a common design of stylus. This use of a simpler receptacle will save time and cost in the production of the computer device.

The extent and scope of the present invention is defined in the appended Claims to which reference should now be made.

DESCRIPTION OF THE DRAWINGS

Figure 1 is a isometric view of a clamshell-style portable computer.

Figure 2 is a side view of a disassembled stylus in accordance with the invention.

Figure 3 is a plan view of the stylus of Figure 2.

Figure 4 is a cross-sectional side view of the stylus of Figure 2 in the direction of arrows A-A in Figure 3.

Figure 5 is an isometric view of the stylus of Figure 2.

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Figure 6 is an isometric view of the stylus of Figure 2, in which the stylus is assembled and in an extended configuration.

Figure 7 is an isometric view of the stylus of Figure 2, in which the stylus is assembled and in an retracted configuration.

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Figure 8 is cross-sectional plan view of a receptacle in accordance with the invention containing a stylus in an extended configuration.

Figure 9 is a plan view of the stylus of Figure 8.

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Figure 10 is a cross-sectional side view of the stylus of Figure 8 in the direction of arrows A-A in Figure 9.

Figure 11 is a similar view as in Figure 8, except that the stylus is in a retracted configuration.

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Figure 12 is a similar view as in Figure 9, except that the stylus is in a retracted configuration.

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Figure 13 is a similar view as in Figure 10, except that the stylus is in a retracted configuration.

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DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS OF THE
INVENTION

5 Figure 1 illustrates one form of a portable microprocessor-based computing system or computer device, such as a handheld personal organiser or "palmtop" computer 20. The housing of the portable computer 20 is a clamshell design, having opposing clamshell upper and lower portions, such as a lid 22 and a base 24. The lid 22 and base 24 are pivotally attached
10 together by a hinge 25. In use, the clamshell lid 22 may be closed over the base 24, then opened by releasing a conventional latch mechanism.

The clamshell base 24 houses a keyboard 30, including a range of alpha, numeric and function keys, which provides a typed-in input to a computer
15 processor unit, housed primarily within the interior of the base 24. The base 24 also has a chamber or receptacle 26 which slidably receives a separate wand unit, pen or stylus 35, which may be used to provide operator input commands to the processor unit, as described further below.

20 The clamshell lid 22 supports a display or screen 40. The display 40 includes a touch-sensitive panel that can be used for operator input. Accordingly, the operator can touch specific portions of the display with the hand-held stylus 35. The portable computer 20 has hardware and software that recognise the position that has been touched. Depending on the
25 operating state of the portable computer 20 or the position relative to the display 40 that is touched, the portable computer might respond to a touch by darkening the corresponding portion of the screen, thus allowing the user to draw graphics or letters. In other situations, a touch might be interpreted as a command.

30 Much of the operation of this type of portable computer 20 consists of the operator moving the pointed writing end of the stylus 35 in a path on the

surface of the active region, using enough pressure to activate the digitizer. Preferably, the level of pressure required approximates that required to make a legible mark with a pencil on a piece of paper. If the computer 20 is expecting a handwriting or drawing input, then the system
5 generates a graphical trace on the display 40, which duplicates the stylus path.

The stylus 35 and the receptacle 26 in accordance with a preferred embodiment of the invention are shown in more detail in Figures 2 to 8.

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The stylus 35 comprises four parts; a cylindrical elongate body portion 50, a stylus tip 52, a stylus head 54, and a helical compression spring 56. These parts are shown disassembled in Figures 2 to 5, and assembled in Figures 6 to 13. The stylus tip 52 is moulded from a wear-resistant plastics material,
15 such as Delrin™ (available from Dupont, Wilmington, Delaware, USA). In contrast, the body portion 50 and the stylus head are moulded from an ordinary plastics material, such as combination of polycarbonate and ABS. The compression spring is preferably formed from a metal or metal alloy, such as stainless steel, wound into a helix.

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The body portion 50 includes at one end a first cavity 58, and at the other end a relatively larger second cavity 60. The wall of the second cavity has a slot-like lateral aperture 66 and a square lateral aperture 68. Between the first and second cavities, the external surface of the body includes an
25 annular indent 70.

The stylus head 54 has a cylindrical cap portion 80, the diameter of which is greater than the internal diameter of the second cavity 60. Depending from the cap portion 80 is a pocket clip portion 81 and another cylindrical portion
30 82, the diameter of which is slightly smaller than the internal diameter of the second cavity 60. Depending from the end of the second cylindrical portion 82 is a sprung portion comprising two parallel arm portions 84, 85 joined

together by an elbow portion 86. The elbow portion 86 is disc shaped and shares the same diameter as the second cylindrical portion. The first arm portion 87 connects the second cylindrical portion to the elbow portion. The second arm portion 88 depends from the elbow portion and includes a first lateral barb 10 approximately midway along its length and a second lateral barb 15 at the end. The two arm portions are sprung away from one another so that the second arm portion is biased towards the pocket clip portion.

Assembly of the stylus involves inserting the stylus tip 52 into the first cavity 58 of the body 50 (see Figure 4). This insertion results in a friction fit between the tip and the body which holds the stylus tip in place. The compression spring 56 is positioned snugly in the second cavity 60 of the body 50. Afterwards, the stylus head 54 is slidably inserted into the second cavity 60 so that the elbow portion 86 is urged against the compression spring 56. The compression spring reacts to bias the stylus head in a direction opposite to the insertion direction.

Once assembled, the stylus 35 can take one of two stable configurations. The first configuration is an extended configuration as shown in Figures 6, 8, 9, and 10, and the second configuration is a retracted configuration as shown in Figures 7, 11, 12, and 13. The stylus head 54 is able to perform a sliding motion relative to the stylus body 50 between the two configurations.

In the extended configuration, the stylus head is positioned so that the first barb 10 is located in the slot-like aperture 66 and the second barb 15 is located in the square aperture 68. The stylus is held in this configuration by the action of the compression spring on the stylus head and the reaction of the aperture edges against the first and second barbs. The barbs, which are biased into the apertures by the outward spring action of the two arm portions 87, 88, thus prevent the stylus head 54 from being released from within the second cavity 60.

In the retracted configuration, the stylus head is positioned so that both the first and second barbs are located in the slot-like aperture 66. The stylus is held in this configuration by the action of the compression spring on the stylus head and the reaction of the slot-like aperture edge against the
5 second barb 15 only.

The stylus head can be released from the retracted configuration by a user simply depressing the outer surface of the pocket clip portion 81. This depression forces the pocket clip portion against the first barb 10 (see arrow
10 F in Figure 13). Continued depression causes the two arm portions 87, 88 of the stylus head to move towards one another. At the same time, the second barb is moved out of the slot-like aperture and into the second cavity 60 of the stylus body. In this state, there is no reaction force to the force of the spring as the second barb is no longer positioned against the edge of the
15 aperture. Consequently, the force of the compression spring slides the stylus head outwards from the second cavity of the stylus body, as indicated by arrow S in Figure 13. Upon reaching the extended configuration, the motion of the stylus head is checked by the action of the barbs on the edges of the apertures as described previously.

20 To return the stylus head back to the retracted configuration, a user slides the stylus head against the bias of the spring by pushing on the exposed end of the cap portion (see arrow T in Figure 10). During the initial stages of this motion, the angled surface of the second barb is cammed against the edge
25 of the square aperture, which forces the barb into the second cavity 60 of the stylus body. Upon reaching the second configuration, the second barb is released into the slot-like aperture to lock the stylus head in the retracted configuration.

30 The receptacle 26 is formed by an opening in the base housing. Figures 8 and 11 show in detail a plan cross-section of the receptacle-forming portion of the base housing. The receptacle includes two sets of guide ribs 90, 92

for guiding and maintaining the stylus 35 in the correct orientation in the receptacle. The receptacle also includes a locking rib 94 for releasably retaining the stylus body in a predetermined storage position. This storage position is illustrated in the Figures 8 and 11.

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To store the stylus in the receptacle, a user inserts the stylus lengthwise and tip first into the opening of the housing. This opening is indicated by the arrow W in Figure 8. During insertion the guide ribs contact and slide against the stylus body, guiding the stylus into slidable contact with the locking rib 94. The locking rib is resiliently deformable and bends back as the stylus is inserted. The locking rib rides over a shoulder of the stylus body before falling into locking engagement in the annular indent 70, whereby the stylus body is releasably locked in the storage position. The resilient nature of the locking rib acts to retain the stylus body in the storage position. If necessary, storage is completed by the user moving the stylus head 54 to the retracted configuration, as previously described. With the stylus body in the storage position and the stylus in the retracted configuration, the exposed surfaces of the stylus become flush with the external housing of the base 24 (see Figure 11). In this stored state, the likelihood of accidentally removing the stylus from the receptacle is minimised.

When it is desired to remove the stylus from the receptacle, a user presses on the exposed surface of the pocket clip portion. This action releases the stylus head, as previously described, so that the stylus assumes the extended configuration (see Figure 8). In this configuration, the stylus head protrudes from the base housing. Whilst holding the personal organiser in one hand, the user then grips the protruding cap portion of the stylus (between the thumb and first finger of the other hand) and pulls the stylus out of the receptacle. Because the stylus protrudes from the receptacle, the user is able to gain sufficient purchase on the stylus to overcome the retaining force of the locking rib 94 without undue burden.

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It will be evident in view of the foregoing description that various modifications may be made to the preferred embodiment within the scope of the present invention. In particular, the displaceable element of the stylus
5 could be implemented in a number of other ways. For example, the element could be a lever pivotally attached to the stylus at one end, which lever could be swung out when the stylus is stored to help remove the stylus from the receptacle. Or, the preferred embodiment could be modified to leave out the spring, apertures, and barbs so that a user simply slides the stylus head to
10 the protruding position when it is desired to remove the stylus from the receptacle.

**CLAIMS**

1. A combination of a stylus and receptacle for implementing in a portable computer device, in which the stylus has an elongate body and an
5 displaceable element, and the stylus receptacle is configured to receive the elongate body of the stylus in a storage position within the receptacle, and the element is displaceable, whilst the elongate body is in the storage position, to a position which enables a user to gain increased purchase on the element so as to remove the stylus from the receptacle.
- 10 2. A combination of a stylus and receptacle as claimed in claim 1, wherein the displaceable element is located at one end of the elongate body and forms a head of the stylus.
- 15 3. A combination of a stylus and receptacle as claimed in claim 1, wherein the receptacle includes means for retaining the pen body in the storage position.
- 20 4. A combination of a stylus and receptacle as claimed in claim 1, wherein the elongate body has a major axis, and the displaceable element is displaceable substantially in the direction of the major axis between a first position in which the stylus configuration is retracted, and a second position in which the stylus configuration is extended.
- 25 5. A combination of a stylus and receptacle as claimed in claim 4, wherein the displaceable element is biased towards the second position.
- 30 6. A combination of a stylus and receptacle as claimed in claim 4, wherein the stylus includes means for releasably locking the displaceable element in the first position.



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7. A combination of a stylus and receptacle as claimed in claim 4, wherein the stylus head is flush with an external housing of the receptacle when the stylus head is in the first position and the elongate body is in the storage position.

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8. A combination of a stylus and receptacle as claimed in claim 4, wherein the stylus head protrudes from an external housing of the receptacle when the stylus head is in the first position and the elongate body is in the storage position, so as to enable a user to gain increased purchase on the element.

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9. A combination of a stylus and receptacle as claimed in claim 1, wherein the receptacle forms part of a housing of a computer device.

15 10. A combination of a stylus suitable for operating a touch screen display and a stylus receptacle, the combination comprising:

said stylus having an elongate body and an element displaceable relative to the elongate body, and

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said stylus receptacle being configured to receive the stylus so that the body is stored in a predetermined storage position substantially completely within the receptacle, whereby the element of the stylus is displaceable whilst the body is in the predetermined storage to a position which enables a user to gain increased purchase on the element so as to remove the body of the stylus from the predetermined storage position.

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