materials, a conductor, such as a metallic wire may be provided to maintain the dielectric difference across the length of the stylus.

The components of the locking mechanism **540** may be formed from any material capable of conducting capacitance from a human user to a touch screen device in order to simulate the dielectric difference typically offered by a human appendage. Examples of potential materials for the components of the locking mechanism **540** include, but are not limited to natural or synthetic rubbers, plastic polymers (such as polypropylene), and metallic materials (such as aluminum). However, embodiments of the present application need not be required to conduct capacitance along their entire length and embodiments may include the conductive tip **501** being electrically isolated from the mouthpiece assembly **520**. Alternatively, the components of the locking mechanism **540** may be formed of any material, including the lightest materials available and/or non-conductive materials. In an embodiment of the mouth stylus having the components of the locking mechanism **540** formed from non-conductive materials, a conductor, such as a metallic wire may be provided to maintain the dielectric difference across the length of the stylus.

Mouth Stylus Operation

FIGS. **13-16** show various angles of the operation of a mouth stylus by a user. Specifically, a mouth stylus **200** being used by a user **400** to operate a touch screen device **300**. The stylus **200** is similar to the embodiment shown in FIGS. **3-8**. Of course alternative embodiments of the extendable stylus could be used. The stylus **200** is inserted into the user's **400** mouth and the user **400** can manipulate the stylus **200** to activate icons or items displayed on the touch screen device **300** using a combination of jaw muscles, oral muscles, facial muscles and neck muscles. Additionally, the user can extend and retract the length of the stylus using the various control means discussed above. For example, extension and retraction of the stylus **200** may be controlled through bite sensors integrated at different portions of the mouthpiece or a tongue paddle integrated into the mouthpiece.

The above description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the invention. Various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles described herein can be applied to other embodiments without departing from the spirit or scope of the invention. Thus, it is to be understood that the description and drawings presented herein represent a presently preferred embodiment of the invention and are therefore representative of the subject matter which is broadly contemplated by the present invention. It is further understood that the scope of the present invention fully encompasses other embodiments that may become obvious to those skilled in the art and that the scope of the present invention is accordingly not limited.

For example, in some embodiments, a miniature laser range finder could be incorporated into the stylus and could be used to measure the distance between the user and the mobile device. In such embodiments, a logic processor could be incorporated into the stylus to automatically extend or retract the extendable portion based on the distance measured by the range finder.

Further, in other embodiments the control mechanism could include an optical system incorporated into the mouthpiece. For example, an IR sensor could be provided in the mouthpiece and an IR sensor, when covered or obscured by a tongue or some other part of the mouth, could trigger extension or retraction of the stylus. In some embodiments, the IR sensor could trigger extension or retraction when a change in measured IR radiation is measured. Further, in some embodiments, the IR sensor could trigger the extension or retraction when a change in measured IR radiation exceeds a threshold.

Further, in other embodiments, the control mechanism could include a wireless receiver (for example, a Bluetooth receiver) in communication with a wireless transmitting device (for example, a Bluetooth control device such as a track pad). In such embodiments, the extension and retraction of the stylus may be controlled via a Bluetooth connection to a track pad (or some other Bluetooth control device) if the user has residual finger control.

Further, in other embodiments, the control mechanism could include one or more sensors that measure airflow within or through the mouthpiece. For example, in such an embodiment, the one or more sensors could measure of direction of air flow to determine if a user is "sucking" air in, or "blowing" air out. In such embodiments, the sensors can initiate extension and retraction of the stylus by detection of "sucking" and "blowing" by the user. In some embodiments, the one or more sensors could trigger extension or retraction when a change in direction of air flow is measured. Further, in some embodiments, the one or more sensors could trigger extension or retraction when an air flow measured exceeds a threshold.

Further embodiments may include the control mechanism being removably connected to the mouthpiece such that the control mechanism of one embodiment may be removed and replaced with a control mechanism of another embodiment. For example, a control mechanism using pressure sensitive bite sensors may be removably connected or integrated into the mouth piece such that the bite sensors can be replaced with optical tongue sensors or air flow sensors based on the capabilities of the user.

Further, in the above discussed embodiments, a conductive tip is provided at the end of the stylus. However, embodiments of the present application are not limited to having a conductive tip and may include tips formed from non-conductive material. For example, a non-conductive paint-brush tip may be attached to the end of the stylus to allow a user to paint. Additionally, the conductive tip and/or the non-conductive tip may be removably connected to the stylus such that the tip can be removed and replaced based on the intended use of the user.

Thus, it is to be understood that the description and drawings presented herein represent a present embodiment of the invention and are therefore representative of the subject matter which is broadly contemplated by the present invention. It is further understood that the scope of the present invention fully encompasses other embodiments that may become obvious to those skilled in the art and that the scope of the present invention is accordingly not limited.

The invention claimed is:

1. An extendable stylus configured to be operated with a mouth, the extendable stylus comprising:

an extending portion configured to have an adjustable length, the extending portion comprising:

a linear portion having the conductive tip connected to a first end thereof;

a nut disposed at a second end of the linear portion opposite the first end;

a power screw, which screwingly engages the nut disposed at the second end of the linear portion, wherein the power screw is rotatable relative to the nut and linear portion; and