excludes any functions associated with the corresponding secondary key of that particular key cluster from contacting the substrate. If a primary key **112** is depressed, the secondary key **116** associated with that key cluster may contact the substrate. If a secondary key **116** is depressed the primary key **112** may not contact the substrate. As shown in **FIG. 9**, each secondary key **116** includes a convex bottom surface **118** which includes electrical traces **119** corresponding to the number of functions designated on the concave upper surface **117** of the secondary key **116**. Selection of one function mutually precludes the selection of the other secondary key functions or the primary key **112** function.

[**0106**] One technique for detecting a depressed condition of a key utilizes a capacitive key wherein a key circuit element forms two spaced apart metallic areas and has a plated pad formed from a metal such as tin, nickel, or copper such that when the key end is brought in close proximity to the current element, a capacitive charge is noted by a keypad circuit board and a key-depressed state is acknowledged by a corresponding keyboard microprocessor and logic unit. An alternative construction incorporates a hard-contact keyboard, wherein the key has a stem which directly engages with the concave cavity, in close proximity with a pair of contacts comprising the circuit element which are then brought into electrically communicative relationship therebetween.

[**0107**] Each key has a first portion of the key exposed on a first side of the cluster key assembly, and a second and third portion of the key exposed on a second side of the cluster key assembly. When the first portion of a key is depressed by a user, the third portion of the key comes into contact with a substrate while its second portion mechanically mutually excludes any functions associated with the corresponding secondary key of that particular key cluster from contacting the substrate.

[**0108**] The primary key **112** travels through a stepped hole-in the key cluster. When the primary key **112** is actuated, a shoulder **114** on the primary key **112** mates with steps **119** in the associated secondary key **116**. This engagement of the shoulder **114** of the primary key **112** with steps in the secondary key **116** traps the secondary key **116** against the substrate and prevents it from rotating and rolling over the surface of the substrate. Since the secondary key **116** is actuated by rotating and rolling over the substrate, the secondary key **116** can not be actuated when the primary key **112** is actuated.

[**0109**] When a secondary key **116** is actuated by rotating and rolling over the surface of the substrate, it positions the associated primary key **112** at an angle with the substrate. If the associated primary key **112** is then depressed, this angle will cause the edge of the primary key **112** to contact the substrate and prevent the bottom face **115** of the primary key **112** from making contact. Since actuation of the primary key **112** is produced by the bottom face **115** contacting the substrate, this prevents actuation of the primary key **112** when the associated secondary key **116** is actuated.

[**0110**] An electronic cluster key arrangement according to the invention is shown in **FIG. 10A**. This cluster key arrangement is electronically configured in the form of a touch screen liquid crystal display (LCD) **132** mounted within a remote telephone **120** which includes a housing **122**, a microphone **124**, and a speaker **126**. obviously, this electronically configured touch screen LCD cluster key arrangement may also be configured for use on cellular/mobile telephones, television remote controls, other hand-held data entry devices, automotive controls, desktop/wall-mounted/cordless telephones, combination telephone recorders, PDAs, and other electronic devices, according to the desires of the user.

[**0111**] The cluster keys in this electronic configuration are preferably displayed in the form of circular, ellipsoidal, pentagonal, etc., images as viewed from the top. The secondary keys each preferably displayed in the form of rectangular, trapezoidal, semi-circular, images which may be elongated to provide more finger contact. The preceding images may be similar to those shown in **FIGS. 1, 2, 3**, and **7**. The housing **122** also includes a liquid crystal display (LCD) **130** for displaying information for the user, a power switch **134**, and a mode switch **136**. The touch screen LCD may be any conventionally configured touch screen LCD. For example, the touch screen LCD may be configured in the form of an upper glass sheet and a lower glass sheet with a thin layer of liquid crystal material including al pressure sensing element sandwiched between the glass sheets. However, the touch screen LCD may also be configured in combination with a transparent thin film solar cell such as a p-i-n junction type amorphous silicon solar cell **140**, as shown in **FIG. 10B**.

[**0112**] Many approaches to the determination of the location of X and Y coordinates of a touch point based on sensing pressure are well known. A pressure-sensitive input device comprising an X-coordinate detection resistive element connected to mutually parallel vertical conductors and a Y-coordinate detection resistive element connected to mutually parallel horizontal conductors, for detecting the position of a point depressed by a stylus or the like, works by detecting changes in the resistance values of these resistive elements. Switches are used for on-off control of the current flowing into or out of both ends of the X-coordinate detection resistive element and the Y-coordinate detection resistive element, and a voltage detection circuit detects the voltage between the X-coordinate detection resistive element and the Y-coordinate detection resistive element. Multiple inputs can be detected based on the results from the voltage detection circuit when the currents are switched by the switches.

[**0113**] The preceding is but one approach to pressure sensing based location determination known in the art. A more sensitive "smarts sensor" type micro-strain gage based localized point sensor located at the midpoint of the keycaps of the primary keys and at the midpoint of the secondary keycaps, located along the circumferences of a circle which constitutes the "virtual circle" along which lie the locus of the centers of the secondary keys of the various a electronic arrangements. This sensitive pressure sensor can output an analog pressure level and its digitized digital equivalent and likewise the rate of change of pressure and its digitized equivalent. The sensor is a smart sensor in that it can be embedded in the carrier material.

[**0114**] The touch screen LCD **132** could be of the monochromatic type or an active matrix full color display. As is known widely to those skilled in the art, an active matrix generally consists of two sheets between which is inserted an electro-optical material such as a liquid crystal. On one